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Monthly Weather Review, July 1943, Vol. 71, page 130: *North Pacific Coast Region*, in the last column (the number of days with thunderstorms) the number for Tatoosh Island should be "4," and for Medford, "3."

MONTHLY WEATHER REVIEW

Editor, EDGAR W. WOOLARD

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FREEZING AND THAWING DATES OF LAKES AND RIVERS AS PHENOLOGICAL INDICATORS

By LEONARD WING

[State College of Washington, Pullman, Wash., May 1942]

Phenology, the study of the progress of seasons, has an important place in investigations of wildlife, as in any other study of free-living organisms, but unfortunately, phenological data are few and rather fragmentary. During several years of study, I have gathered phenological material, such as the time of blooming of plants, freezing and thawing of lakes and rivers, and migration arrival and departure of birds. Scattered though it may be, there appears to be a wealth of such data and a concerted effort to gather it together would be desirable. Newspapers, for example, occasionally sponsor contests for guessing the moment when ice leaves rivers or harbors. Navigation records and travel journals, too, frequently contain valuable phenological information.

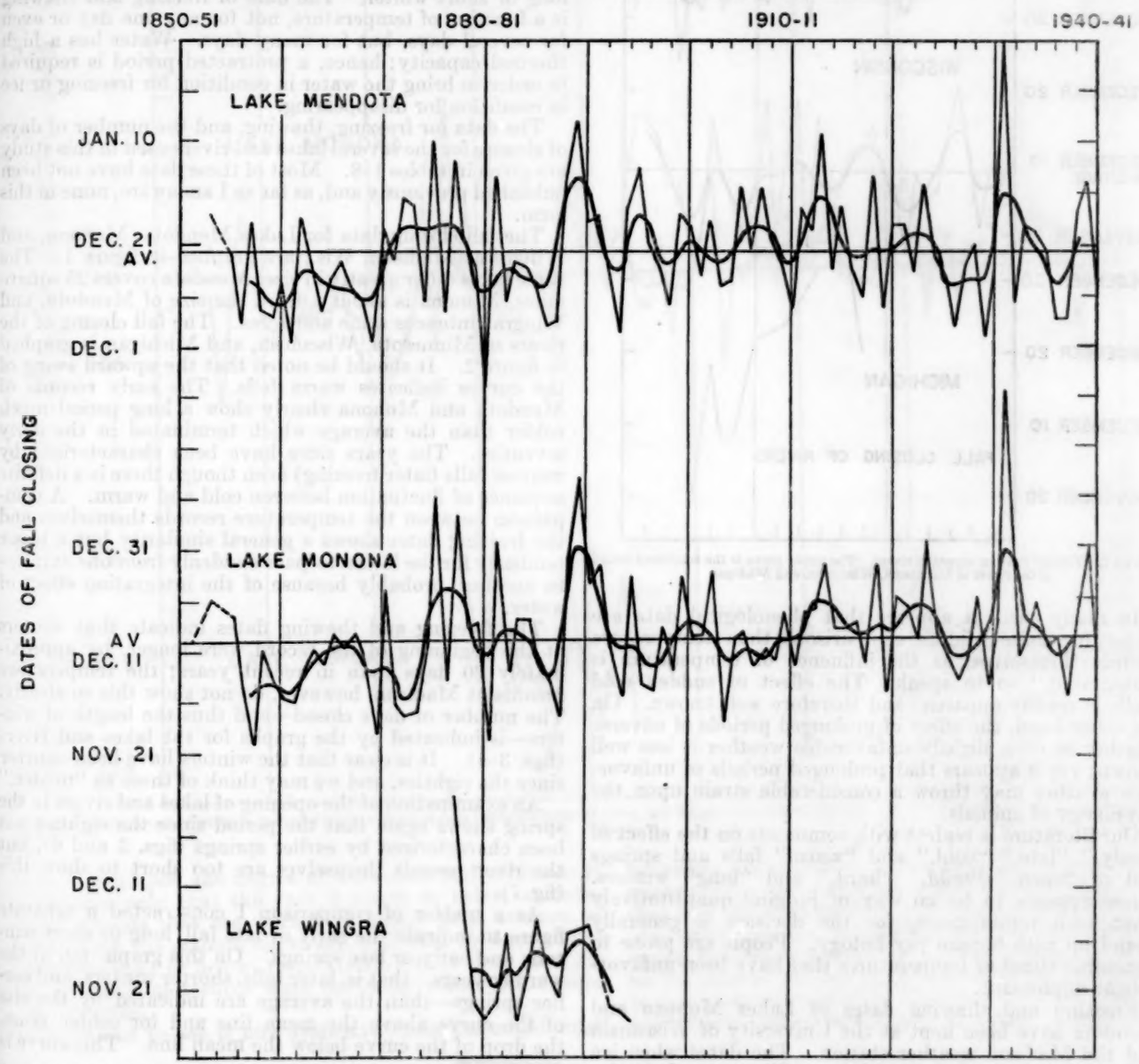


FIGURE 1.—The fall freezing record of Lakes Mendota, Monona, and Wingra, Madison, Wis. The smoothed dates are shown by the heavy curve; the upward swing of the curves indicates late freezing, and, therefore, a late fall.

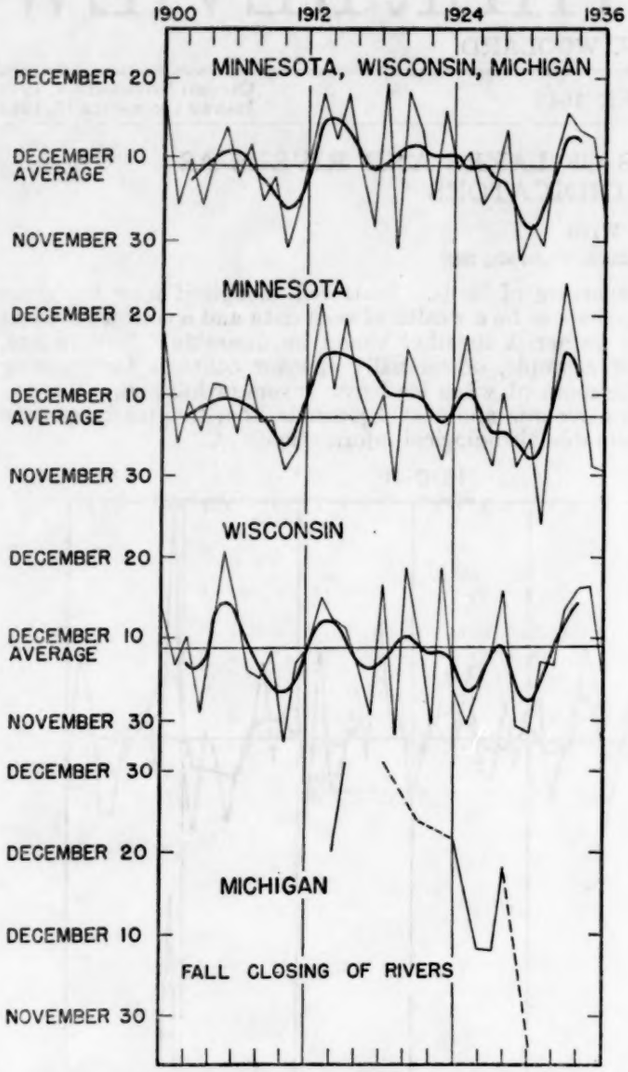


FIGURE 2.—The fall freezing record of rivers. The upper curve is the combined record of the rivers of Minnesota, Wisconsin, and Michigan

In many cases it appears that phenological data are better for some wildlife comparisons than temperature records themselves, as the influence of temperature is "integrated," so to speak. The effect of sudden cold spells is readily apparent and therefore well known. On the other hand, the effect of prolonged periods of adverse weather or even slightly unfavorable weather is less well known; yet it appears that prolonged periods of unfavorable weather may throw a considerable strain upon the physiology of animals.

Our literature is replete with comments on the effect of "early," "late," "cold," and "warm" falls and springs and of "open," "mild," "hard," and "long" winters. There appears to be no way of judging quantitatively what such terms mean, for the decision is generally bound up with human psychology. People are prone to remember times or temperatures that have been unfavorable or unpleasant.

Freezing and thawing dates of Lakes Monona and Mendota have been kept at the University of Wisconsin and the Madison weather station. The dates when ice left nearby Rock Lake at Lake Mills, were kept by Frank Foote from 1887 to 1915 and by Charles Kleist from 1916 to 1940. The thawing dates for Lake Geneva, Wis., were kept by Dr. Edwin Frost from 1900 to 1930. Records at Lake Wingra have been obtained from the Chase records.[1] The volumes of the DAILY RIVER STAGES have been combed for indications when rivers of Minnesota, Wisconsin and Michigan opened in the spring and closed in the fall. The data are not always usable because some observations began or ceased on fiscal or calendar dates, but these were generally recognizable as such. The data for the various river stations were averaged for each State (the number varying to 16 a year for any one State.)

Study of the various data indicates that the fall freeze-up is a good indicator of a late or early fall. The spring thaw, on the other hand, is a good indicator of late or early spring. In a like manner, the length of interval between a fall freeze and the following spring thaw indicates a long or short winter. The date of freezing and thawing is a function of temperature, not for any one day or even for several days, but for many days. Water has a high thermal capacity; hence, a protracted period is required in order to bring the water in condition for freezing or ice in condition for disappearing.

The data for freezing, thawing, and the number of days of closure for the several lakes and rivers used in this study are given in tables 1–8. Most of these data have not been published previously and, as far as I am aware, none in this form.

The fall closing data for Lakes Mendota, Monona, and Wingra at Madison, Wis., are graphed in figure 1. The three lakes differ greatly in size: Mendota covers 25 square miles, Monona is about a third the size of Mendota, and Wingra embraces some 400 acres. The fall closing of the rivers of Minnesota, Wisconsin, and Michigan is graphed in figure 2. It should be noted that the upward swing of the curves indicates warm falls. The early records of Mendota and Monona clearly show a long period much colder than the average which terminated in the early seventies. The years since have been characterized by warmer falls (later freezing) even though there is a definite sequence of fluctuation between cold and warm. A comparison between the temperature records themselves and the freezing dates shows a general similarity but a lesser tendency for the latter to pass suddenly from one extreme to another, probably because of the integrating effect of water.

The freezing and thawing dates indicate that winters at the beginning of the record were longer, by approximately 20 days than in recent years; the temperature records at Madison, however, do not show this so clearly. The number of days closed—and thus the length of winters—is indicated by the graphs for the lakes and rivers (figs. 3–4). It is clear that the winters have been shorter since the eighties, and we may think of these as "milder."

An examination of the opening of lakes and rivers in the spring shows again that the period since the eighties has been characterized by earlier springs (figs. 5 and 6), but the river records themselves are too short to show this (fig. 7).

As a matter of comparison I constructed a separate figure to indicate the early or late fall, long or short winters, and early or late springs. On this graph (fig. 8) the warmer years—that is, later falls, shorter winters, and earlier springs—than the average are indicated by the rise of the curve above the mean line and for colder years, the drop of the curve below the mean line. This curve is

[1] Leopold, Trans. Wis. Acad. Sci. Arts. & Letters. 30:69–76.

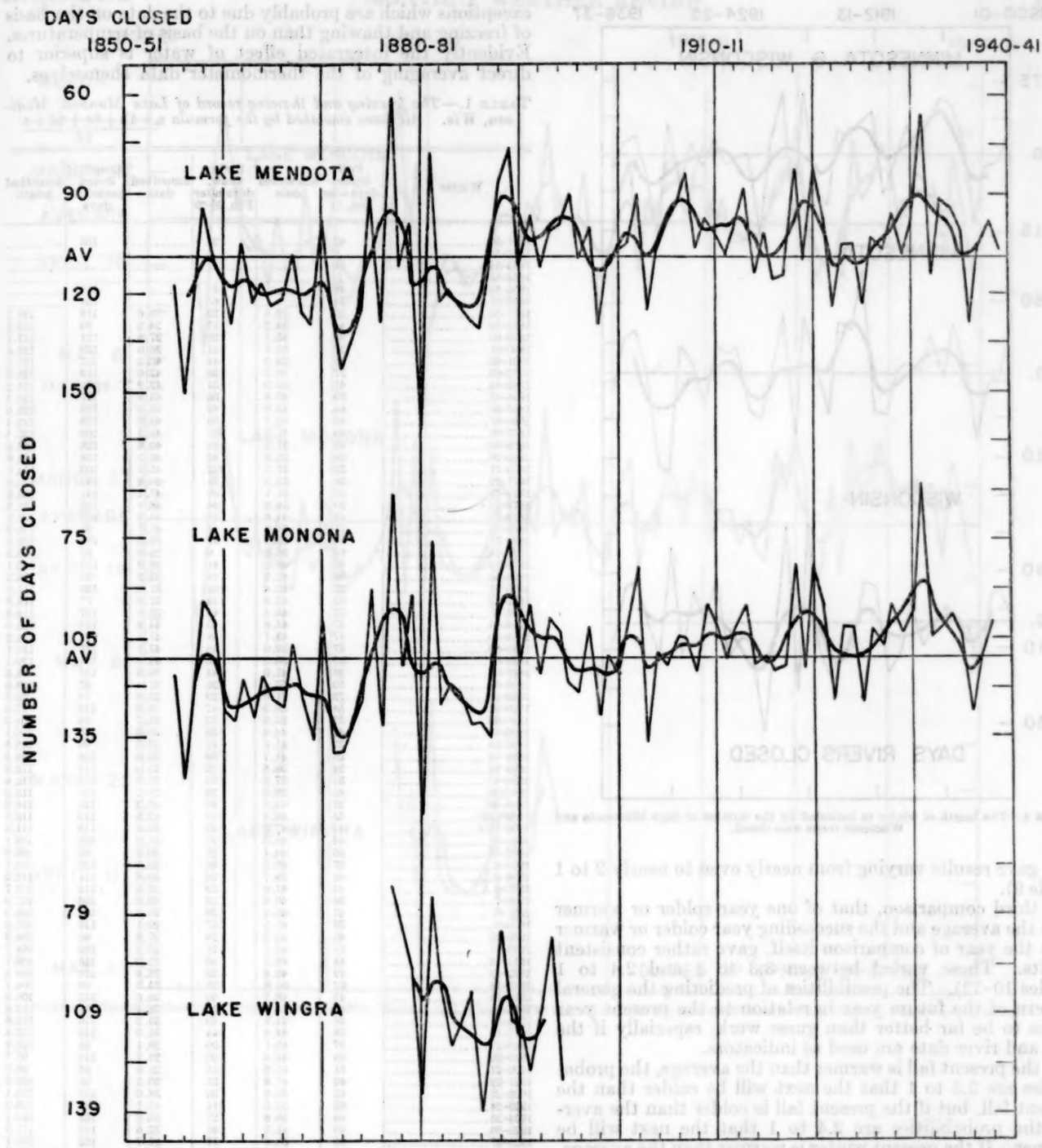


FIGURE 3.—The length of winter as indicated by the number of days Lakes Mendota, Monona, and Wingra were covered with ice. The upward swing of the curves indicates short winters.

not based upon the degree of warmness and coldness; it indicates only that the year is above or below average. The periods that are warmer or colder than average as shown by the smooth curve are indicated by heavy lines placed above or below, respectively. It is clear that the early years of records were distinctly colder than more recent ones.

In order to see if any systematic relation might exist between a series of years, I compared the springs, falls, and winters with each other on a moving three-year basis—that is, if one year were colder or warmer than the preceding, what was the possibility that the succeeding year would be colder or warmer? I also compared the years on the basis of one year colder or warmer than the average to determine the possibility that the succeeding year would be colder or warmer than the average itself. These compari-

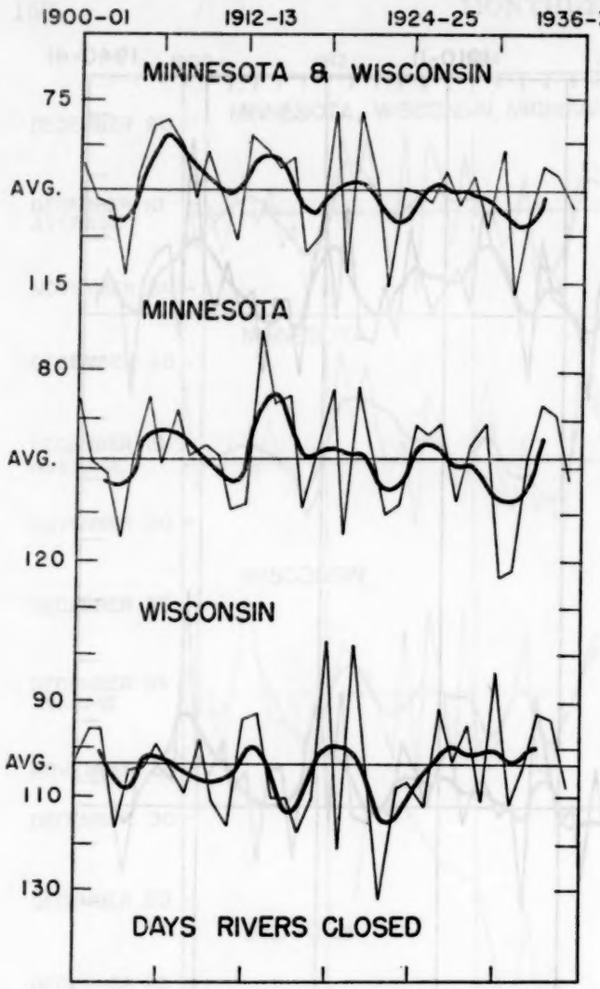


FIGURE 4.—The length of winter as indicated by the number of days Minnesota and Wisconsin rivers were closed.

sons gave results varying from nearly even to nearly 2 to 1 (table 9).

A third comparison, that of one year colder or warmer than the average and the succeeding year colder or warmer than the year of comparison itself, gave rather consistent results. These varied between 3.3 to 1 and 2.4 to 1 (tables 10–12). The possibilities of predicting the general pattern of the future year in relation to the present year seems to be far better than guess work, especially if the lake and river date are used as indicators.

If the present fall is warmer than the average, the probabilities are 3.3 to 1 that the next will be colder than the present fall, but if the present fall is colder than the average the probabilities are 2.4 to 1 that the next will be warmer. If the present winter is warmer than the average, the probabilities are 2.6 to 1 that the next winter will be colder than the present winter, but if the present winter is colder than the average the probabilities are 2.4 to 1 that the next will be warmer. If the present spring is warmer than the average the probabilities are 2.8 to 1 that the next spring will be colder than the present spring, but if the present spring is colder than the average the probabilities are 2.6 to 1 that the next spring will be warmer

The ratio of comparison is higher with but one or two exceptions which are probably due to the data on the basis of freezing and thawing than on the basis of temperatures. Evidently the integrated effect of water is superior to direct averaging of the thermometer data themselves.

TABLE 1.—*The freezing and thawing record of Lake Monona, Madison, Wis. All dates smoothed by the formula* $\frac{a+4b+6c+4d+e}{16}$

Winter	Full freeze, days after Oct. 31	Smoothed date	Spring thaw, days after Feb. 28–29	Smoothed date	Length of frozen period in days	Smoothed length
1851–52	43		25		103	
1852–53						
1853–54	51					
1854–55						
1855–56	48		45		118	
1856–57	34		65		151	
1857–58	23	32.6	22	32.6	119	120.1
1858–59	41	34.2	15	24.2	94	110.2
1859–60	36	35.1	26	27.8	111	113.1
1860–61	32	33.6	41	36.0	129	122.6
1861–62	31	33.6	44	40.5	133	127.0
1862–63	37	36.3	36	42.0	119	126.0
1863–64	41	39.0	51	42.9	131	124.2
1864–65	39	40.8	36	43.8	117	123.3
1865–66	44	42.0	49	45.0	125	123.0
1866–67	42	42.6	50	43.8	128	122.4
1867–68	44	41.2	31	41.3	108	120.4
1868–69	40	37.8	46	40.6	126	123.0
1869–70	24	36.6	42	40.3	138	123.8
1870–71	52	37.2	32	41.1	100	124.1
1871–72	30	34.5	51	44.8	142	130.6
1872–73	28	31.1	49	47.1	141	136.3
1873–74	29	34.6	45	46.1	136	131.5
1874–75	42	44.6	45	44.3	123	119.9
1875–76	71	51.8	41	41.7	91	110.2
1876–77	35	53.1	47	35.5	132	102.6
1877–78	67	52.6	9	29.0	62	96.5
1878–79	46	49.0	41	28.9	115	100.1
1879–80	46	42.3	18	34.2	93	112.3
1880–81	22	40.4	62	37.8	160	117.6
1881–82	62	43.8	19	37.6	77	113.9
1882–83	37	45.4	44	39.6	127	114.4
1883–84	47	44.8	46	44.4	120	120.0
1884–85	47	43.1	48	47.1	121	124.2
1885–86	37	39.0	48	47.1	131	128.1
1886–87	35	36.0	46	44.8	131	129.1
1887–88	28	41.0	44	39.3	137	118.6
1888–89	59	53.4	26	37.4	87	100.6
1889–90	75	61.6	29	33.8	74	92.3
1890–91	54	59.5	47	36.8	113	97.6
1891–92	57	51.8	32	35.7	96	104.3
1892–93	41	44.4	38	30.3	117	106.1
1893–94	32	41.6	11	27.3	99	105.8
1894–95	55	41.7	39	30.0	104	108.5
1895–96	34	39.5	32	33.0	119	113.8
1896–97	33	37.8	36	33.3	123	115.6
1897–98	45	39.9	26	35.1	101	115.3
1898–99	37	43.6	46	40.3	129	116.6
1899–1900	55	46.4	47	42.9	112	116.5
1900–1901	44	47.0	42	38.4	118	111.3
1901–2	44	46.6	27	31.6	103	105.1
1902–3	56	44.1	21	30.8	85	106.9
1903–4	27	40.3	46	35.1	140	115.1
1904–5	43	39.7	34	36.8	111	117.3
1905–6	44	41.0	39	33.6	115	112.7
1906–7	38	40.6	24	29.6	106	107.0
1907–8	41	40.3	26	28.9	106	108.6
1908–9	39	41.6	37	29.1	118	107.8
1909–10	48	42.8	24	27.6	96	104.9
1910–11	38	43.7	21	28.2	103	104.7
1911–12	48	46.3	40	32.0	113	106.1
1912–13	49	49.8	33	34.4	104	104.8
1913–14	57	50.6	33	35.3	96	104.7
1914–15	45	48.3	40	36.6	115	108.6
1915–16	45	45.5	35	38.4	111	112.6
1916–17	46	44.3	42	39.2	116	112.6
1917–18	38	44.8	44	35.9	116	107.4
1918–19	57	45.1	20	29.1	83	101.6
1919–20	33	44.8	28	23.8	116	98.7
1920–21	51	45.8	16	23.6	85	98.0
1921–22	49	47.8	25	30.3	96	102.6
1922–23	43	49.8	50	38.6	127	109.1
1923–24	62	50.5	44	40.1	103	110.0
1924–25	44	46.8	27	36.8	103	110.1
1925–26	40	41.0	46	32.6	126	111.6
1926–27	35	38.8	17	27.7	102	109.1
1927–28	39	40.6	26	24.6	108	104.3
1928–29	51	42.1	27	23.4	96	101.5
1929–30	33	44.8	17	22.6	104	98.0
1930–31	46	53.9	24	24.1	98	99.4
1931–32	91	60.3	30	26.6	60	86.6
1932–33	40	54.5	27	27.3	107	93.1
1933–34	43	46.9	26	27.1	103	100.3
1934–35	50	44.9	28	28.1	98	104.1
1935–36	41	43.2	27	30.9	107	110.5
1936–37	43	40.3	43	32.1	130	115.8
1937–38	31	41.0	22	31.1	111	112.7
1938–39	49	46.8	31		102	
1939–40	61		43		102	
1940–41	33					
Average	43.4 Dec. 13		35.2 Apr. 4		111.6	

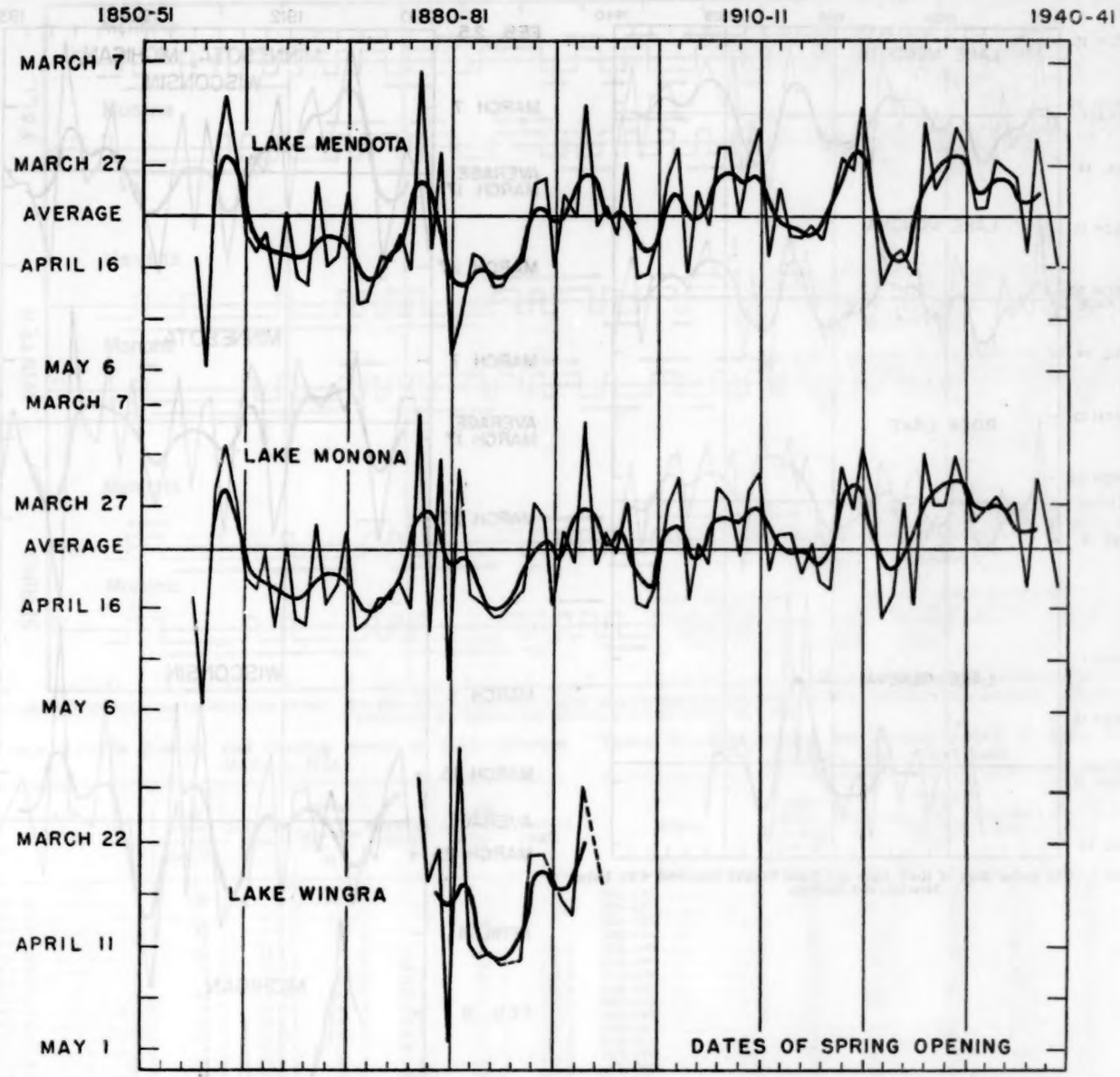


FIGURE 5.—The spring-thawing records of Lakes Mendota, Monona, and Wingra. The upward swing of the curves indicates early thawing and, therefore, early spring.

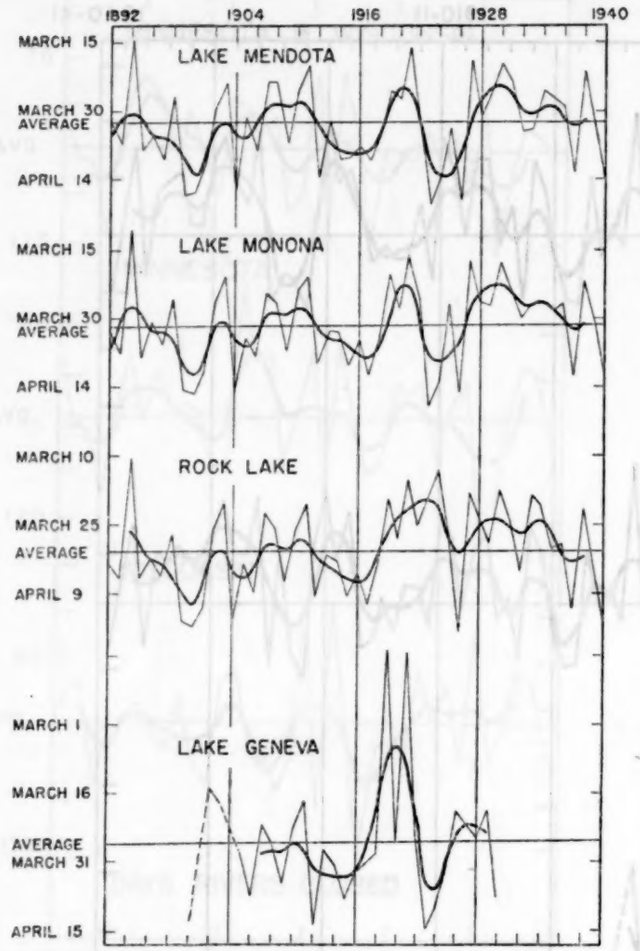


FIGURE 6.—The spring thaw of Rock Lake and Lake Geneva compared with Lakes Mendota and Monona.

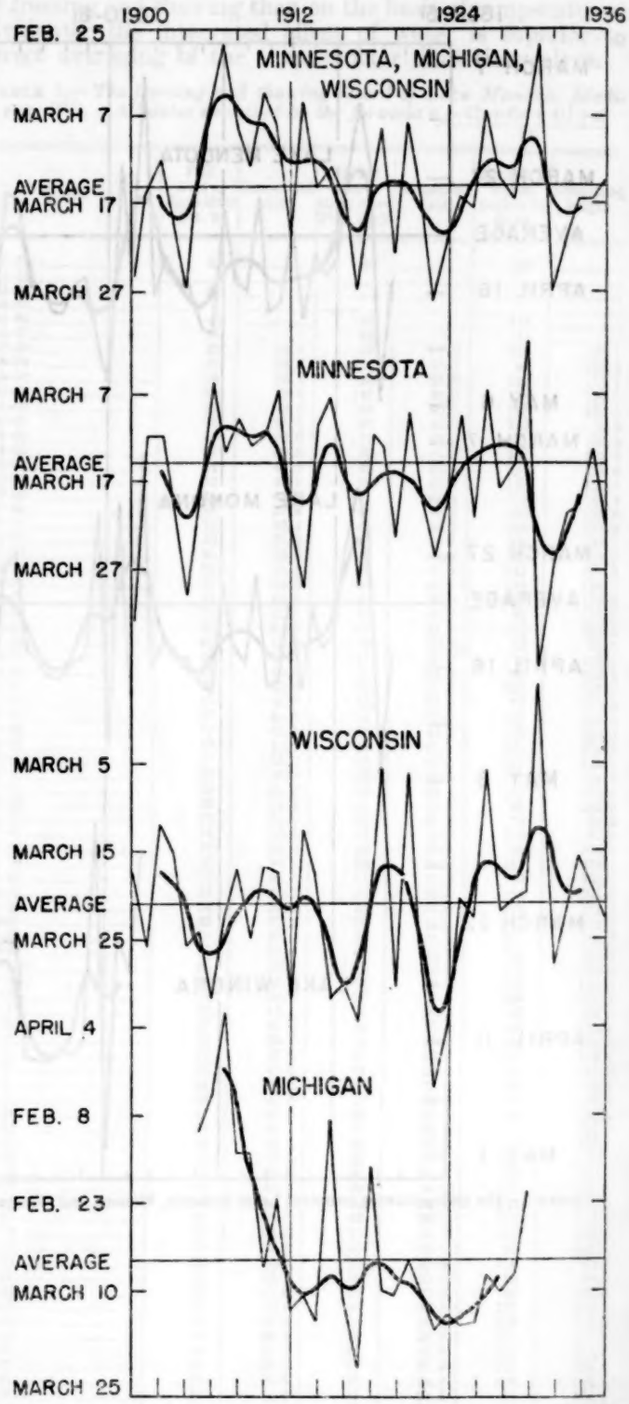


FIGURE 7.—The spring-thawing record of rivers of Minnesota, Wisconsin, and Michigan. The top curve is the combined thawing record for all rivers.

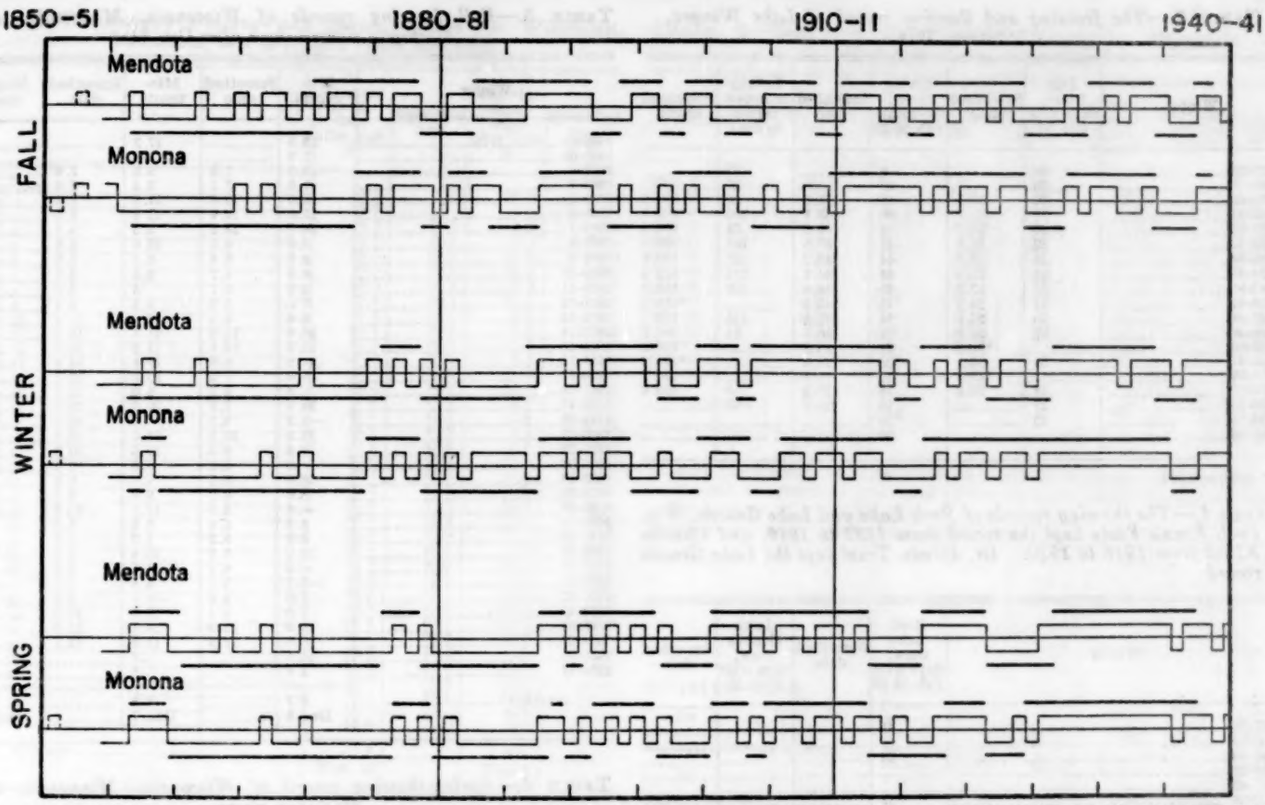


FIGURE 8.—Graph indicating variation from average. The light curve is based upon original data, the heavy line upon *smoothed* data. The heavy lines and swing of the curve below the median line indicate falls, winters, or springs *colder* than average.

TABLE 2.—*The freezing and thawing record of Lake Mendota, Madison, Wis.*

Winter	Full freeze days after Nov. 30	Smoothed date	Spring thaw days after Feb. 28–29	Smoothed date	Length of frozen period in days	Smoothed length
1853–54	27					
1854–55						
1855–56	18		45		118	
1856–57	6		67		151	
1857–58	25	14.4	26	34.4	121	121.4
1858–59	8	12.2	14	25.0	96	110.5
1859–60	7	9.8	26	27.9	110	110.3
1860–61	14	9.6	41	36.2	117	116.9
1861–62	2	12.3	44	41.6	132	119.4
1862–63	26	16.1	40	43.8	104	117.9
1863–64	18	16.2	52	44.3	125	118.4
1864–65	8	13.8	36	44.4	118	120.9
1865–66	14	13.6	49	45.3	125	121.8
1866–67	18	12.5	51	44.3	123	120.8
1867–68	12	12.5	31	41.9	110	119.8
1868–69	10	9.9	47	41.4	127	121.8
1869–70	2	11.3	43	41.4	131	120.4
1870–71	24	17.3	33	42.9	99	118.3
1871–72	19	22.6	54	47.5	126	124.7
1872–73	30	25.4	54	49.9	144	133.6
1873–74	29	24.6	45	47.8	136	132.1
1874–75	10	23.6	46	45.1	126	121.1
1875–76	41	24.0	41	42.2	91	110.5
1876–77	8	24.4	48	36.1	130	101.9
1877–78	37	24.8	9	30.2	62	95.6
1878–79	21	21.4	43	31.6	112	100.4
1879–80	17	14.1	25	39.9	99	114.1
1880–81	7	11.8	64	48.7	161	119.4
1881–82	33	15.3	52	50.9	78	114.1
1882–83	10	17.1	44	48.2	124	113.6
1883–84	18	16.3	46	47.4	119	119.5
1884–85	17	14.8	51	48.8	124	124.2
1885–86	12	12.6	50	48.8	128	126.2
1886–87	5	14.0	46	96.4	131	122.6
1887–88	24	22.1	46	41.5	113	109.8
1888–89	33	31.6	31	36.4	88	95.1
1889–90	45	34.8	30	35.7	75	91.0
1890–91	26	30.8	47	37.7	111	97.1
1891–92	27	23.7	33	36.4	97	103.1
1892–93	16	17.1	38	31.6	112	104.8
1893–94	4	16.4	15	29.2	101	103.2
1894–95	28	22.8	39	32.3	101	99.8
1895–96	36	27.1	36	36.1	91	99.4
1896–97	21	23.4	41	36.6	110	103.4
1897–98	17	17.8	27	37.9	100	110.1
1898–99	9	17.3	49	42.3	130	115.1
1899–1900	27	20.1	48	44.3	111	113.7
1900–1901	25	22.0	42	39.8	107	107.8
1901–1902	15	20.1	30	33.8	105	103.2
1902–1903	23	18.8	24	33.1	89	104.6
1903–1904	13	17.6	48	36.3	120	109.1
1904–1905	14	19.3	32	36.8	108	107.7
1905–1906	32	23.3	39	33.1	97	99.9
1906–1907	20	25.8	24	29.1	94	93.6
1907–1908	32	25.6	24	28.6	83	93.3
1908–1909	22	22.6	38	29.5	106	97.2
1909–1910	18	18.2	26	28.6	98	100.4
1910–1911	9	17.8	20	29.6	101	102.2
1911–1912	28	22.6	45	34.1	108	102.1
1912–1913	24	28.3	32	37.3	99	99.6
1913–1914	43	30.0	41	38.9	88	99.6
1914–1915	16	26.2	41	40.0	115	104.1
1915–1916	28	21.9	39	40.2	102	108.7
1916–1917	16	18.9	42	38.7	116	110.1
1917–1918	11	18.9	36	34.7	115	105.9
1918–1919	34	20.2	26	29.4	82	99.3
1919–1920	9	20.4	28	25.2	110	95.2
1920–1921	25	21.0	16	25.5	81	94.8
1921–1922	25	22.2	31	32.7	96	100.9
1922–1923	16	23.0	50	41.5	123	108.5
1923–1924	32	23.3	45	45.4	104	110.2
1924–1925	19	20.5	44	44.6	105	110.6
1925–1926	16	15.3	50	39.3	124	111.6
1926–1927	6	13.0	19	32.1	103	108.7
1927–1928	17	14.3	32	27.9	106	103.9
1928–1929	21	14.2	27	25.8	96	101.8
1929–1930	3	15.2	20	24.4	107	99.3
1930–1931	16	23.9	24	26.6	98	92.9
1931–1932	61	31.1	35	30.8	65	90.0
1932–1933	10	27.8	35	31.0	115	94.1
1933–1934	25	22.9	26	29.6	91	96.6
1934–1935	24	21.3	28	29.4	94	98.4
1935–1936	20	17.2	30	32.2	101	105.6
1936–1937	7	12.6	44	33.4	128	111.4
1937–1938	7	14.7	22	32.8	105	108.5
1938–1939	28	21.8	35		97	
1939–1940	33		47		105	
1940–1941	14					
Average	19.7 Dec. 20		37.3 Apr. 6		108.6	

TABLE 3.—*The freezing and thawing record of Lake Wingra, Madison, Wis.*

Winter	Fall freeze, days after Oct. 31	Smoothed date	Spring thaw, days after Feb. 28–29	Smoothed date	Length of frozen period in days	Smoothed length
1877–78	59		9		70	
1878–79	36		29		85	
1879–80	19	25.1	23	31.6	96	100.2
1880–81	16	25.1	60	33.1	136	105.1
1881–82	20	21.6	2	30.2	74	100.6
1882–83	32	23.3	41	33.4	101	102.1
1883–84	15	23.1	44	40.7	121	109.6
1884–85	24	25.0	44	44.1	112	112.9
1885–86	35	27.3	45	44.6	102	116.3
1886–87	24	26.3	*45	*43.4		*119.6
1887–88	20	25.8	44	37.8	116	113.1
1888–89	32	28.9	24	30.1	84	104.2
1889–90		*31.8	24	26.8		*106.4
1890–91	34	30.1	*28	*28.5		*114.6
1891–92		*25.9	33	30.6		*116.2
1892–93	18	20.6	36	27.2	110	109.8
1893–94	17		10	*21.7	85	
1894–95	15		*20			
1895–96			30			

* Interpolated.

TABLE 4.—*The thawing records of Rock Lake and Lake Geneva, Wis. Frab Frank Foote kept the record from 1887 to 1916, and Charles Kliest from 1916 to 1940. Dr. Edwin Trast kept the Lake Geneva record*

Winter	Rock Lake thaw, days after Feb. 28–29	Smoothed date	Lake Geneva thaw, days after Dec. 31	Smoothed date
1887–88	45			
1888–89				
1889–90	29			
1890–91				
1891–92				
1892–93	34			
1893–94	37			
1894–95	11	26.6		
1895–96	36	29.1		
1896–97	33	32.8		
1897–98	36	33.6		
1898–99	27	37.4		
1899–1900	46	40.7		
1900–1901	47	43.2	104	
1901–02	43	38.6		
1902–3	26	31.6	74	
1903–4	21	30.7	77	
1904–5	46	35.1		
1905–6	34	37.0	88	
1906–7	40	33.8	98	
1907–8	23	29.6	82	88.1
1908–9	26	29.1	86	87.8
1909–10	38	30.0	95	87.8
1910–11	26	28.7	83	86.0
1911–12	21	29.0	77	87.0
1912–13	41	32.3	104	91.1
1913–14	32	34.4	88	92.6
1914–15	33	35.4	91	92.9
1915–16	41	37.2	98	93.8
1916–17	36	38.4	93	93.1
1917–18	42	36.8	90	88.1
1918–19	33	31.9	89	78.1
1919–20	20	26.4	44	68.6
1920–21	28	23.1	86	65.1
1921–22	16	21.8	44	68.3
1922–23	25	21.0	84	80.4
1923–24	20	20.0	105	93.9
1924–25	14	21.6	100	96.9
1925–26	27	28.1	93	91.8
1926–27	48	31.9	79	84.9
1927–28	19	28.6		*82.5
1928–29	24	25.1	85	83.2
1929–30	29	24.1	79	
1930–31	18	23.9	98	
1931–32	25	25.6		
1932–33	35	26.6		
1933–34	19	24.7		
1934–35	21	24.1		
1935–36	30	27.4		
1936–37	29	31.8		
1937–38	43	33.0		
1938–39	22	32.4		
1939–40	35			
1940–41	46			
Average	30.9 Mar. 31		85.2 Mar. 26	

*Interpolated.

TABLE 5.—*Fall freezing records of Wisconsin, Minnesota, and Michigan rivers—days after Oct. 31*

Winter	Wisconsin	Smoothed date	Minnesota	Smoothed date	Michigan
1900–01	13.5		17.3		
1901–02	7.0		4.0		
1902–3	10.0	7.3	9.0	7.6	
1903–4	1.0	7.1	5.6	8.2	
1904–5	10.0	10.8	11.5	9.4	
1905–6	21.0	14.4	11.3	9.6	
1906–7	14.5	13.2	5.3	9.1	
1907–8	6.0	9.1	12.6	8.8	
1908–9	5.5	6.4	6.5	7.6	
1909–10	8.5	4.7	6.5	5.1	
1910–11	2.8	3.7	.3	3.7	
1911–12	7.0	5.6	3.3	6.1	
1912–13	9.0	9.5	12.0	11.4	
1913–14	15.0	12.0	21.3	15.2	
1914–15	12.2	12.1	11.2	15.8	20.0
1915–16	11.2	9.9	12.4	14.4	31.0
1916–17	6.6	7.2	10.5	12.2	
1917–18	.5	6.7	6.0	11.1	
1918–19	16.8	7.7	20.0	10.6	31.0
1919–20	−1.2	9.1	−.4	10.0	
1920–21	18.8	10.1	16.0	10.5	
1921–22	9.5	9.2	12.0	10.0	24.0
1922–23	−.5	8.2	5.8	7.3	
1923–24	18.6	8.3	2.0	6.3	
1924–25	3.6	6.2	9.5	9.1	21.3
1925–26	−.4	3.6	17.5	10.5	16.2
1926–27	4.8	5.0	5.5	8.0	8.0
1927–28	8.3	8.2	1.3	5.6	7.7
1928–29	16.0	8.8	10.4	5.2	18.0
1929–30	−.6	4.4	1.6	4.0	
1930–31	−1.1	2.1	4.4	2.0	−4.0
1931–32	7.0	4.9	−6.0	3.8	
1932–33	7.0	8.1	13.5	10.2	
1933–34	13.5	12.3	24.0	15.8	
1934–35	16.0	14.3	15.0	12.7	
1935–36	16.5		.8		
1936–37	5.4		.5		
Average	8.2 Dec. 8		6.8 Dec. 7		13.4 Dec. 13

TABLE 6.—*Spring-thawing record of Wisconsin, Minnesota, and Michigan rivers*

Winter	Minnesota rivers, days after Jan. 31	Smoothed date	Wisconsin rivers, days after Feb. 28–29	Smoothed date	Michigan rivers, days after Feb. 28–29	Smoothed date
1900–1901	61.0		17.5			
1901–2	40.3		26.0			
1902–3	40.3	44.4	12.0	17.6		
1903–4	47.0	47.5	15.5	18.4		
1904–5	58.0	49.3	25.7	22.4		
1905–6	44.8	45.2	24.3	26.1	−17.0	
1906–7	33.5	40.1	32.7	26.8	−23.3	
1907–8	41.5	38.7	23.0	24.1	−38.0	−25.3
1908–9	37.7	39.3	17.0	21.4	−13.5	−19.0
1909–10	40.8	39.4	25.0	20.0	−13.5	−9.6
1910–11	39.7	39.2	15.5	19.4	6.3	−2.4
1911–12	34.5	41.5	17.3	20.7	−5.5	2.6
1912–13	50.0	46.5	31.8	21.5	12.7	7.5
1913–14	57.0	47.9	12.7	20.1	11.3	10.6
1914–15	38.7	43.3	17.5	21.4	14.8	9.3
1915–16	35.1	40.6	31.2	26.5	−2.2	7.8
1916–17	42.5	43.9	30.0	30.0	11.1	9.6
1917–18	57.0	46.7	34.3	27.6	23.2	9.2
1918–19	39.8	45.3	20.4	21.0	−11.0	5.5
1919–20	41.0	44.0	3.8	16.8	10.0	5.4
1920–21	51.2	44.2	30.8	17.0	10.7	7.8
1921–22	37.3	44.6	6.3	19.4	5.3	8.9
1922–23	47.5	46.6	25.8	25.9	10.4	11.0
1923–24	53.5	48.3	42.0	32.6	16.8	13.8
1924–25	46.8	46.3	35.0	31.7	14.4	15.1
1925–26	37.4	43.5	20.3	24.9	15.5	14.8
1926–27	49.1	42.1	22.3	18.5	15.4	13.0
1927–28	34.4	41.6	6.0	15.8	7.1	10.5
1928–29	45.4	41.2	21.8	17.5	10.1	7.8
1929–30	43.0	41.0	20.5	18.2	7.0	
1930–31	28.8	44.3	20.3	14.3	−7.0	
1931–32	66.0	51.4	−6.3	12.3		
1932–33	54.7	54.0	27.7	16.5		
1933–34	48.8	50.6	21.8	19.9		
1934–35	47.8	47.1	15.7	19.4		
1935–36	41.4		19.6			
1936–37	40.8		22.3			
Average	*42.8 Mar. 15		*21.2 Mar. 21		*4.5 Mar. 5	

* Based on original data.

TABLE 7.—*Average freezing and thawing dates for Wisconsin, Minnesota, and Michigan rivers combined*

Winter	Freezing dates, days after Jan. 31	Smoothed date	Thawing date, days after Nov. 30	Smoothed date
1900-1901	53.2		15.8	
1901-2	43.8		4.8	
1902-3	40.2	44.2	9.3	7.3
1903-4	45.6	46.1	4.3	8.5
1904-5	54.8	46.5	10.0	9.3
1905-6	40.0	41.3	13.7	10.5
1906-7	32.5	34.2	7.6	10.1
1907-8	26.3	31.7	11.5	8.8
1908-9	36.4	34.1	5.2	7.1
1909-10	40.5	35.6	7.3	4.8
1910-11	32.0	36.3	−.9	3.6
1911-12	35.5	35.0	4.5	4.9
1912-13	48.4	40.0	11.2	10.6
1913-14	33.2	40.0	18.1	14.2
1914-15	42.8	40.4	12.7	15.0
1915-16	40.8	42.7	17.8	13.2
1916-17	44.8	46.2	8.4	10.1
1917-28	55.1	47.6	1.9	8.8
1918-19	43.8	45.2	19.5	9.3
1919-20	36.2	42.8	−.6	10.2
1920-21	50.5	42.4	18.2	11.4
1921-22	35.5	42.8	13.6	11.2
1922-23	44.5	45.8	2.5	10.0
1923-24	56.3	48.9	15.9	10.2
1924-25	48.7	48.7	8.6	10.2
1925-26	43.5	45.6	10.2	8.4
1926-27	45.4	42.1	4.2	9.1
1927-28	34.1	40.1	6.3	7.3
1928-29	42.5	40.8	13.4	6.4
1929-30	44.4	40.7	−2.3	3.4
1930-31	38.7	38.3	2.1	1.6
1931-32	20.5	39.2	−.5	3.9
1932-33	55.0	44.9	10.7	8.5
1933-34	49.2	48.2	15.6	
1934-35	44.3	46.1	13.3	
1935-36	44.5		6.8	
1936-37	42.6		2.7	
Average	42.5		8.9	
	Mar. 15		Dec. 9	

TABLE 8.—*Length of closed period, Wisconsin, Minnesota, and Michigan rivers*

Winter	Minnesota	Smoothed length	Wisconsin	Smoothed length	Combined average length	Smoothed average length	Michigan
1900-1901	85.0		102.5		90.0		
1901-2	98.3		95.0		97.4		
1902-3	100.1	101.9	95.5	101.4	98.3	101.0	
1903-4	114.4	103.1	115.7	105.6	113.5	101.5	
1904-5	95.3	97.8	104.3	105.6	92.8	94.5	
1905-6	84.2	92.5	101.7	102.4	80.8	90.0	
1906-7	98.2	91.7	98.5	101.2	79.7	83.7	
1907-8	87.1	92.5	102.0	102.7	86.9	87.3	
1908-9	96.3	93.8	109.5	103.9	97.3	90.9	
1909-10	95.2	96.1	97.0	104.9	86.7	93.0	
1910-11	96.2	99.8	110.1	107.2	96.6	95.7	
1911-12	108.7	101.9	115.8	106.2	105.9	95.7	
1912-13	107.0	96.0	93.7	100.9	94.0	91.3	
1913-14	69.4	86.4	92.5	99.5	86.6	88.2	
1914-15	85.9	84.3	109.0	104.6	90.1	89.7	48.0
1915-16	85.1	90.8	109.8	110.5	89.0	95.0	71.1
1916-17	108.5	96.5	117.7	110.7	108.7	99.5	69.0
1917-18	95.8	96.2	109.9	104.4	103.9	98.4	
1918-19	83.0	95.4	77.0	99.3	78.7	95.5	69.0
1919-20	113.6	96.3	123.0	98.3	113.1	94.2	
1920-21	83.3	96.1	77.5	99.5	79.3	93.4	
1921-22	97.5	98.6	106.3	106.8	92.9	95.6	76.4

TABLE 8.—*Length of closed period, Wisconsin, Minnesota, and Michigan rivers*—Continued

Winter	Minnesota	Smoothed length	Wisconsin	Smoothed length	Combined average length	Smoothed average length	Michigan
1922-23	109.7	103.0	132.5	114.6	115.8	101.4	
1923-24	106.8	101.9	107.4	113.8	94.8	100.6	
1924-25	89.9	96.4	106.7	109.0	96.9	97.3	84.2
1925-26	93.6	93.6	112.7	105.0	97.2	95.7	89.3
1926-27	90.9	95.5	91.2	101.1	91.9	95.2	93.1
1927-28	106.1	97.6	104.5	99.5	98.2	95.4	93.4
1928-29	94.6	97.7	94.5	100.3	93.0	96.3	79.0
1929-30	89.2	102.3	110.9	99.9	103.0	97.0	
1930-31	123.6	105.1	84.4	99.9	86.4	99.6	
1931-32	122.7	105.9	111.7	102.0	117.5	102.9	
1932-33	97.3	101.9	104.8	101.4	100.5	101.0	
1933-34	85.8	92.6	92.2		90.7	95.9	
1934-35	88.4		93.2		93.2		
1935-36	102.0		97.8		97.8		
Average	96.9		103.0		95.3		77.7

TABLE 9.—*Comparison of years on basis of colder or warmer than the average or previous year and following year colder or warmer than the average or previous year*

Comparison of—	Basis	Average			
		Warmer		Colder	
		Colder	Warmer	Colder	Warmer
Fall and following fall	Previous year				
	Succeeding year	68.73	31.27	37.24	62.76
Do	Average				
	Average	52.40	47.60	53.84	46.16
Fall and following spring	Previous year				
	Succeeding year	48.32	51.68	50.49	49.51
Do	Average				
	Average	47.86	52.14	52.32	47.62
Spring and following spring	Previous year				
	Succeeding year	64.04	35.96	30.78	69.22
Spring and following fall	Previous year				
	Succeeding year	57.20	42.80	47.50	52.50
Do	Average				
	Average	53.38	46.62	50.25	49.75
Winter and following winter	Previous year				
	Succeeding year	60.66	39.34	35.10	64.90
Do	Average				
	Average	46.59	53.41	49.74	50.26

TABLE 10.—*Comparison of falls on basis of colder or warmer than the average and the next year colder or warmer than the previous year*

	Wisconsin temperature	Madison temperature	Lake Mendota	Lake Monona	Wisconsin rivers	Minnesota rivers	Average
Number of years	47	73	80	79	34	36	
Warmer falls than average	22	36	36	36	19	19	
Next fall colder than previous	77.27	75.00	80.56	75.00	73.68	78.95	76.74
Next fall warmer than previous	22.73	25.00	19.44	25.00	26.32	21.05	23.26
Colder falls than average	25	37	44	43	15	17	
Next falls colder than previous	28.00	24.32	36.36	30.23	26.67	29.41	29.16
Next fall warmer than previous	72.00	75.68	63.64	60.77	73.33	70.59	70.84

TABLE 11.—*Comparison of winters on the basis of colder or warmer than the average and the next colder or warmer than the previous year*

	Wisconsin temperatures	Madison temperatures	Lake Mendota	Lake Monona	Wisconsin Rivers	Minnesota Rivers	Average
Years	1891-1939	1853-1939	1853-1940	1851-1940	1900-1936	1900-1936	
Number of years	46	78	83	79	35	35	
Average	20.6°	22.9°	[1] 108.6	[1] 111.6	[1] 103.0	[1] 96.9	
Warmer winters than average	25	49	43	38	16	18	
Next winter colder than previous	84.00	61.22	67.44	71.05	81.25	66.67	71.94
Next winter warmer than previous	16.00	38.78	32.56	28.95	18.75	33.33	28.06
Colder winters than average	21	29	40	41	19	17	
Next winter colder than previous	38.10	20.69	37.50	29.27	26.32	23.53	29.24
Next winter warmer than previous	61.90	79.31	62.50	70.73	73.68	76.47	70.76

[1] Days.

TABLE 12.—*Comparison of springs on the basis of colder or warmer than the average and the next colder or warmer than the previous year*

	Wisconsin temperatures	Madison temperatures	Lake Mendota	Lake Monona	Wisconsin rivers	Minnesota rivers	Michigan rivers	Lake Geneva	Rock Lake	Average of all
Years	1891–1939	1853–1939	1853–1940	1851–1940	1900–1936	1900–1936	1905–30	1900–1930	1887–1940	
Number of years	47	81	79	81	36	35	23	24	48	
Average	29.7	31.30	Apr. 6	Apr. 4	Mar. 21	Apr. 7	Mar. 5	Mar. 26	Mar. 31	
Warmer springs than average	22	44	37	40	18	17	7	9	25	
Next spring colder than previous	72.73	54.55	75.68	80.00	83.33	70.59	71.43	77.78	80.00	74.01
Next spring warmer than previous	27.27	45.45	24.32	20.00	16.67	29.41	28.57	22.22	20.00	25.99
Colder than average	25	37	42	41	18	18	11	15	23	
Next spring colder than previous	24.00	37.84	23.81	24.39	16.67	16.67	43.75	26.67	34.78	27.62
Next spring warmer than previous	76.00	62.16	76.19	75.61	83.33	83.33	56.25	73.33	65.22	72.38

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR SEPTEMBER 1943

[Climate and Crop Weather Division, J. B. KINCER, in charge]

AEROLOGICAL OBSERVATIONS

NOTICE.—Effective with the December 1942 issue, the publication of table 1 (RAOB summaries) was discontinued indefinitely.—EDITOR.

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during September 1943. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°). Velocities in meters per second*

Altitude (meters) m. s. l.	Abilene, Tex. (538 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (870 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (17 m.)			Cincinnati, Ohio (152 m.)			Denver, Colo. (1,627 m.)			El Paso, Tex. (1,196 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	135	1.5	30	216	1.7	28	27	1.1	30	303	2.2	30	272	3.5	30	314	4.0	29	79	4.1	30	256	2.2	30	250	0.8	30	88	1.2	30	258	0.6	30	52	1.6	30	145	0.6
500							28	42	0.7										28	72	3.9	30	242	4.1	30	232	1.8	30	92	2.2	30	230	1.6						
1,000	30	131	2.5				28	70	0.9				30	262	3.2	30	308	3.3	27	104	2.1	28	239	4.9	29	237	3.5	29	78	1.8	29	240	1.8						
1,500	26	127	2.5				27	97	1.5	30	269	2.1	30	274	4.9	30	301	2.7	27	106	1.3	27	252	6.3	28	263	4.9	26	18	1.5	28	254	2.6				30	149	1.3
2,000	25	108	2.5	30	209	2.1	26	97	1.0	30	281	3.0	27	277	6.4	30	308	1.4	23	112	1.4	25	262	6.3	26	256	6.2	22	318	1.3	26	267	3.6	30	51	2.0	29	130	1.3
2,500	24	114	1.4	30	226	1.3	26	323	.3	29	283	6.0	26	285	8.5	30	277	2.0	21	108	1.0	16	257	4.8	22	258	8.6	19	320	1.6	24	274	5.1	30	43	1.2	27	119	.6
3,000	22	101	1.1	29	254	1.4	25	301	1.7	28	287	8.0	26	287	10.0	30	272	3.4	19	99	1.5	14	263	4.5	17	269	7.5	18	297	2.1	22	266	8.0	30	309	1.8	26	173	.4
4,000	20	25	1.5	27	276	2.6	22	282	4.7	28	290	11.8	22	287	12.1	30	280	5.8	16	127	1.0				11	266	10.0	16	302	2.2	19	271	8.6	29	294	6.3	24	16	1.1
5,000	19	322	2.1	22	299	4.6	19	286	7.5	26	288	14.0	21	296	12.4	29	277	6.4	15	28	.8							14	281	4.5	13	293	7.1	28	295	8.4	24	328	1.5
6,000	17	304	3.4	19	297	4.8	18	286	8.4	22	293	13.8	16	299	15.2	27	278	7.6	13	285	.7							13	293	5.8				28	291	8.9	21	290	2.5
8,000	14	285	7.9	14	292	7.4	13	286	13.3	19	294	15.1	13	297	18.9	22	279	9.3	10	334	1.1							11	295	6.7				20	293	10.2	16	282	8.8
10,000	10	281	10.3				10	285	18.6	18	303	14.4	10	274	16.9	17	276	6.5															18	291	13.6			
12,000										15	308	16.8																				14	288	15.1			
14,000																																		12	282	13.2			

Altitude (meters) m. s. l.	Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (16 m.)			Joliet, Ill. (178 m.)			Las Vegas, Nev. (573 m.)			Little Rock, Ark. (88 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (15 m.)			Mobile, Ala. (66 m.)			Nashville, Tenn. (194 m.)			New York, N. Y. (15 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	222	1.1	30	306	1.5	28	68	0.7	29	286	2.3	29	74	4.5	29	235	1.3	30	164	1.4	30	98	0.9	30	309	1.1	29	104	2.5	28	57	1.6	29	56	0.7	30	24	1.7
500							28	44	.9				29	75	5.4	29	252	1.9				30	111	1.6	30	319	1.4	29	97	4.8	28	74	1.7	29	117	.7	29	330	1.0
1,000							28	10	.8	29	288	4.0	27	76	4.1	29	248	3.5	30	172	1.7	27	81	1.6	30	332	1.3	28	90	3.1	27	66	1.9	27	187	.6	26	301	2.2
1,500				30	295	2.6	28	328	.9	29	282	4.4	25	72	1.9	27	251	4.7	30	175	1.8	26	59	1.2	30	227	.1	26	86	1.6	25	66	2.5	26	43	.4	23	301	3.6
2,000	30	232	1.3	30	290	3.3	28	329	1.7	29	281	4.9	22	349	.7	23	266	5.9	30	202	2.1	24	338	1.5	30	153	1.4	25	83	.9	21	58	1.9	26	292	1.2	22	299	4.2
2,500	30	224	1.6	30	279	3.5	28	314	3.0	28	284	6.8	17	289	1.0	22	271	6.9	30	221	2.6	20	329	3.1	29	148	1.1	20	104	.6	19	16	.5	26	301	3.7	21	292	4.3
3,000	30	230	2.0	30	275	3.7	26	301	3.7	25	278	8.2	16	291	2.1	20	271	7.0	30	230	3.3	18	305	3.9	29	134	1.0	18	147	.8	17	334	1.0	25	290	5.3	18	286	7.3
4,000	30	247	3.1	29	268	4.5	22	285	5.2	22	285	10.6	14	273	2.5	13	266	6.7	28	240	3.7	14	307	6.0	29	198	.9	16	57	1.0	11	360	2.6	25	294	7.1	12	288	7.0
5,000	26	265	4.5	26	275	5.7	19	273	7.3	18	290	12.3	12	262	3.6				28	243	3.2	13	306	5.8	28	211	1.7	14	29	1.6							17	299	7.7			
6,000	26	270	5.7	23	284	7.8	17	285	5.1	15	286	12.6							27	261	3.1	11	303	8.2	25	302	1.2	10	50	2.0				14	293	12.0			
8,000	21	275	7.9				12	263	7.8										22	270	4.2				21	270	2.1							11	293	16.3			
10,000	18	281	9.3				12	279	11.6										18	279	5.7				17	297	4.1							10	280	23.2			
12,000	15	276	12.1																14	269	14.0				13	304	8.2												
14,000																			11	265	17.9																		

TABLE 2.—*Free-air resultant winds based on pilot-balloon observations made near 5 p. m. (75th meridian time) during September 1943. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°). Velocities in meters per second*

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (388 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			St. Paul, Minn. (225 m.)			San Antonio, Tex. (240 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie, Mich (230 m.)			Seattle, Wash. (12 m.)			Spokane, Wash (603 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	273	5.2	29	148	2.7	30	76	0.6	30	281	0.6	30	9	2.0	30	270	0.7	29	236	1.8	29	76	2.2	30	293	3.9	30	279	2.9	30	294	2.9	30	279	1.2	27	316	1.4
500	30	293	2.4	29	156	2.6	30	183	.5	30	243	.7	----	----	----	30	318	1.0	29	239	2.5	29	88	3.2	30	301	3.0	30	281	3.6	30	10	1.3	----	----	----	27	328	1.6
1,000	25	226	.9	29	163	2.6	29	222	.6	30	246	.5	30	7	2.0	29	270	1.3	28	248	3.4	29	90	4.3	28	270	1.3	30	271	4.6	25	33	.6	30	243	1.8	25	325	1.5
1,500	25	189	1.5	29	174	2.6	29	264	2.4	30	242	.8	30	324	2.5	28	258	2.8	25	259	5.8	29	99	4.5	28	225	1.4	27	266	6.3	24	347	.2	29	254	1.9	25	305	2.7
2,000	25	182	1.8	28	216	2.3	26	265	4.9	30	233	.8	30	302	3.1	27	271	5.3	21	260	9.0	26	93	3.7	27	202	1.6	21	268	8.9	24	295	1.4	29	260	3.4	23	295	4.3
2,500	25	186	2.6	26	270	3.0	25	275	7.8	30	252	.7	30	288	5.4	27	275	7.2	19	266	8.9	23	87	2.6	26	199	2.7	16	276	8.3	23	287	2.4	28	275	3.5	23	287	5.0
3,000	25	188	3.9	24	285	5.1	25	273	9.1	30	230	.4	29	280	7.8	26	278	7.7	18	272	9.7	20	98	1.7	26	190	3.2	13	279	8.9	23	282	3.5	28	286	5.1	22	285	6.3
4,000	25	196	4.2	23	291	8.4	22	293	10.5	30	274	1.5	26	298	11.9	21	281	9.4	12	286	10.5	16	42	1.2	21	183	4.6	----	----	----	18	263	3.9	25	301	7.9	21	281	7.5
5,000	23	211	4.9	22	292	10.2	21	285	14.7	29	263	1.4	23	308	13.4	17	285	9.6	----	----	----	14	348	4.0	16	221	3.2	----	----	----	14	285	5.9	24	298	9.1	17	283	9.0
6,000	22	216	4.9	22	300	10.2	20	290	17.2	25	285	2.2	20	299	14.6	15	288	12.6	----	----	----	10	337	5.6	12	278	3.6	----	----	----	13	290	5.2	23	300	10.7	14	270	12.3
8,000	20	244	6.0	18	291	11.1	10	292	16.1	23	278	5.6	18	299	18.0	10	296	16.2	----	----	----	10	304	8.2	----	----	----	----	----	----	11	255	5.9	19	307	11.9	----	----	----
10,000	16	242	7.8	15	275	17.5	----	----	----	20	266	13.7	15	296	18.0	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	16	299	13.3	----	----	----
12,000	12	252	7.6	10	264	25.5	----	----	----	14	266	18.5	12	313	18.4	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	14	305	18.6	----	----	----

TABLE 3.—*Maximum free-air wind velocities (m. p. s.), for different sections of the United States, based on pilot-balloon observations during September 1943*

Section	Surface to 2,500 meters (m. s. l.)					Above 2,500 to 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	30.6	n	640	15	Nantucket, Mass.	41.0	wsw.	4,700	9	Caribou, Maine	57.6	asw.	12,870	14	Albany, N. Y.
East-Central [2]	25.8	nne.	990	29	Hatteras, N. C.	41.6	w.	4,200	16	Cincinnati, Ohio	64.0	wnw.	10,310	17	Huntington, W. Va.
Southeast [3]	20.5	e.	610	26	Tampa, Fla.	24.4	w.	3,940	24	Spartanburg, S. C.	58.8	wnw.	13,270	24	Birmingham, Ala.
North-Central [4]	52.2	w.	2,150	7	Duluth, Minn.	42.8	wsw.	4,060	7	Alpena, Mich.	59.1	nnw.	11,230	20	St. Paul, Minn.
Central [5]	30.3	sw.	1,740	18	Omaha, Nebr.	38.0	w.	4,600	7	Moline, Ill.	54.6	w.	17,620	28	Fort Wayne, Ind.
South-Central [6]	30.0	nne.	2,130	16	San Antonio, Tex.	26.6	wnw.	3,810	8	Little Rock, Ark.	63.0	sw.	16,100	16	Oklahoma City, Okla.
Northwest [7]	33.3	wsw.	2,160	21	Pocatello, Idaho.	37.4	nw.	4,950	7	Billings, Mont.	72.0	w.	19,360	25	Great Falls, Mont.
West-Central [8]	29.8	w.	2,470	2	Rock Springs, Wyo.	29.7	w.	2,500	2	Rock Springs, Wyo.	59.0	w.	17,470	27	Reno, Nev.
Southwest [9]	27.1	s.	1,910	14	Roswell, N. Mex.	45.3	s.	3,000	14	Roswell, N. Mex.	52.2	wnw.	13,150	13	Santa Maria, Calif.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

Precipitation during September was decidedly below normal over the greater part of the country. Areas having above normal precipitation were confined mainly to the west and central Gulf of Mexico regions, the South-Central States and portions of Arizona and New Mexico.

Abnormally low river stages prevailed in most of the eastern and southern sections of the country except in northern New England, and southern Louisiana and Mississippi.

Unusually intense local rains along the Arkansas River above Great Bend, Kans., resulted in a sharp rise in that river, reaching a crest of 8.2 feet (.2 foot above flood stage) at Great Bend on September 6. Severe thunderstorms in scattered areas in southern California on September 24, resulted in some damage from washing. From reports at hand, the areas affected were in the vicinities of Perrin and Blythe, Calif., and between Lancaster and Mojave, Calif. No other flooding of consequence was reported.

CLIMATOLOGICAL DATA

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

[For description of tables and charts, see REVIEW January 1942, p. 15]

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Section	Temperature							Precipitation					
			Monthly extremes							Greatest monthly		Least monthly	
	Section average	Departure from the normal	Station	Highest	Date	Station	Lowest	Date	Section average	Departure from the normal	Station	Amount	Station	Amount
	°F.	°F.		°F.			°F.		In.	In.		In.		In.
Alabama	72.7	−3.0	Union Springs	98	[1] 1	Valley Head	38	[1] 25	4.40	+0.88	Spring Hill	10.06	Alexander City	1.15
Arizona	73.8	+1.1	Mohawk	114	[1] 11	Alpine	29	28	1.70	+.36	Sierra Ancha	4.90	Yuma Valley	.00
Arkansas	70.4	−3.9	3 stations	104	[1] 1	Gilbert	38	26	3.23	−.08	Mountainburg	7.50	2 stations	.81
California	71.1	+3.7	2 stations	115	[1] 6	Portola	21	26	.08	−.38	Blythe Airport	1.85	198 stations	.00
Colorado	58.4	+.3	Kit Carson	100	18	Pearl	12	6	.39	−1.00	La Veta Pass	1.97	13 stations	.00
Florida	79.0	−.4	2 stations	98	[1] 1	Vernon	50	25	6.44	−.22	New Smyrna	13.40	Quincy	1.55
Georgia	72.5	−2.9	do	99	2	Blairsville	33	26	3.23	−.35	Dalton	7.20	Savannah Beach	.15
Idaho	60.5	+3.4	Grand View	102	11	Sun Valley	15	[1] 4	.18	−.88	Island Park Dam	1.09	29 stations	.00
Illinois	63.6	−4.2	3 stations	103	1	5 stations	30	26	2.41	−1.23	Benton	6.24	Morse	.65
Indiana	63.2	−4.0	Scottsburg	106	1	2 stations	30	24	3.13	−.16	La Porte	5.72	Whiting	1.04
Iowa	60.3	−3.6	2 stations	94	5	3 stations	27	20	2.18	−1.62	State Center	5.04	Onawa	.34
Kansas	67.5	−2.2	Sedan	102	2	2 stations	29	20	2.39	−.43	Coffeyville	8.52	Syracuse	.00
Kentucky	66.4	−4.0	Bowling Green	104	1	Pippapass	33	18	2.58	−.30	Mammoth Cave	5.98	Cynthiana	.82
Louisiana	75.1	−2.8	4 stations	100	[1] 1	2 stations	46	[1] 10	10.15	+6.12	Franklin	25.40	Doyline	1.69
Maryland-Delaware	65.9	−1.8	do	99	[1] 1	Oakland, Md	25	27	1.88	−1.41	Snow Hill, Md	6.25	Luke, Md	.04
Michigan	56.6	−3.3	2 stations	97	1	Grayling	17	24	2.27	−.89	Battle Creek	5.67	St. James	.50
Minnesota	55.4	−3.7	Chaska	91	1	Bemidji	21	25	1.80	−1.05	Tower	4.33	Park Rapids	.12
Mississippi	73.1	−2.8	Kosciusko	103	1	Duck Hill	41	26	5.57	+2.50	2 stations	13.32	Enterprise	1.38
Missouri	65.8	−3.5	2 stations	102	1	Arcadia	33	[1] 26	3.51	−.49	Dexter	7.43	Vichy	.43
Montana	56.5	+1.3	Roundup	98	17	2 stations	13	19	.37	−.98	Summit	1.97	5 stations	T
Nebraska	62.9	−1.5	Benkleman	100	18	Ewing	23	20	.87	−1.20	Falls City	4.39	Potter	.00
Nevada	65.9	+4.6	Overton	111	7	Golliher Pasture	11	4	.22	−.20	Adaven	1.99	21 stations	.00
New England	58.7	−1.5	Weston, Mass	94	7	Lake Frontiere Maine	19	29	1.85	−1.90	Randolph, N. H	4.80	3 stations	.34
New Jersey	65.0	−.8	2 stations	98	7	Charlotteburg	26	27	1.85	−1.94	Egg Harbor City	4.76	Brooklawn	.23
New Mexico	64.6	+.2	Orogrande	104	12	Selsor Ranch	18	8	.98	−.79	Kingston	4.13	Corona	T
New York	59.7	−1.5	2 stations	98	[1] 1	2 stations	20	[1] 26	1.45	−2.00	Babylon	6.09	Honk Falls	.04
North Carolina	67.9	−3.1	do	100	[1] 2	do	28	[1] 25	2.79	−1.11	New Holland	7.51	Wenona	.36
North Dakota	55.6	−1.2	Crosby	94	27	Edmore	19	23	.51	−1.03	McLeod	1.78	2 stations	.04
Ohio	62.5	−3.1	Cincinnati	100	1	4 stations	30	[1] 18	1.83	−1.09	Montpelier	4.96	New Philadelphia	.26
Oklahoma	73.0	−1.2	2 stations	106	[1] 1	Watts	36	18	2.75	−.39	Nowata	9.62	Castaneda	.00
Oregon	62.4	+4.5	Oakridge	104	23	Enterprise	18	19	.11	−1.07	Tillamook	1.02	43 stations	.00
Pennsylvania	61.4	−2.8	Middletown	102	1	2 stations	18	26	.72	−2.61	Erie	3.38	Newport	.04
South Carolina	71.1	−3.3	Calhoun Falls	99	[1] 5	Longcreek	37	26	3.14	−.84	Conway	7.53	Beaufort	.24
South Dakota	60.1	−1.5	Longvalley	97	18	Custer	22	9	.68	−.83	Watertown	2.51	Deerfield	.02
Tennessee	67.8	−3.6	2 stations	102	1	Rugby	32	[1] 25	5.31	+2.32	Columbia	10.34	Tazewell	2.45
Texas	75.4	−1.9	Henrietta	107	5	Dalhart	40	[1] 20	3.48	+.50	Orange	15.42	Dumas	.02
Utah	64.0	+3.2	2 stations	101	[1] 7	2 stations	23	[1] 3	.38	−.66	2 stations	2.00	10 stations	.00
Virginia	65.9	−2.7	3 stations	100	[1] 1	Burkes Garden	25	18	2.32	−.74	Langley Field	6.68	Winchester	.25
Washington	62.1	+3.3	Trinidad	101	12	Chewelah	23	19	.43	−1.38	Highley Peak	4.52	27 stations	.00
West Virginia	62.5	−3.8	2 stations	100	[1] 1	3 stations	26	[1] 18	1.25	−1.62	Camden on Gauley	3.99	Piedmont	.12
Wisconsin	55.9	−4.4	Richland Center	91	1	Prentice	22	17	1.86	−1.86	Danbury	3.92	Milwaukee	[2] .34
Wyoming	56.3	−1.5	Arvada	96	17	Lamar Ranger Station	14	9	.42	−.72	Glenrock	1.88	4 stations	.00
Alaska (August)	52.0	−.8	3 stations	85	[1] 3	2 stations	27	17	4.88	+1.43	Annex Creek	17.00	Shishmaref	1.71
Hawaii	75.6	+.6	2 stations	94	[1] 6	Volcano Observatory	48	22	3.61	−2.30	Ku Kui, Maui	16.00	7 stations	.00
Puerto Rico	78.9	+.3	Coloso	96	2	Guineo Reservoir	55	20	6.52	−1.99	Adjuntas	15.92	San Francisco	1.57

[1] Other dates also.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station	Pressure: Sea level	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°*F.*	°*F.*	°*F*		°*F*	°*F*		°*F*	°*F*	°*F.*	*%*	*In.*	*In.*		*Miles*								0–10	*In.*	*In.*	
New England							60.1	−0.2									81	1.81	−1.3										5.6			
Eastport	75	67	85	30.02	30.11	+0.08	55.8	0.0	76	9	62	41	29	49	27	50	83	3.74	+1.0	10	8.0	nw.	27	n.	15	12	7	11	5.1	0.0	0.0	0
Greenville, Maine	1,070	6	41	28.97	30.15	.....	52.7	+.3	75	9	66	27	29	40	42	47	.....	2.38	−1.4	10	.....	nw.	.....	.....	.....	6	11	13	.....	.0	.0	1
Portland, Maine [1]	103	5	43	30.00	30.13	+.08	57.4	.....	79	16	68	33	19	47	36	50	84	1.64	−1.5	9	6.6	n.	20	e.	30	13	6	11	5.1	.0	.0	4
Concord [1]	289	4	45	29.81	30.14	+.08	57.8	−1.5	86	7	70	31	18	45	43	50	83	.73	−2.7	7	5.1	nw.	21	w.	16	11	9	10	5.6	.0	.0	4
Burlington [1]	403	6	64	29.66	30.11	+.05	58.4	−1.6	84	6	69	33	26	48	38	50	79	1.71	−1.8	7	7.7	s.	26	s.	27	7	12	11	5.9	.0	.0	3
Boston [1]	124	33	62	29.97	30.11	+.04	63.0	.....	85	16	71	44	19	55	26	51	75	1.41	−1.7	8	10.6	ne.	51	ne.	30	7	8	15	6.4	.0	.0	1
Nantucket	12	11	59	30.07	30.09	+.0.	62.8	.0	80	7	68	48	19	57	20	57	86	3.54	+1.1	8	11.7	ne.	43	ne.	15	8	8	14	6.2	.0	.0	1
Block Island	26	11	46	30.06	30.10	+.02	63.5	+.4	79	5	69	46	18	58	19	57	83	1.65	−1.0	8	14.8	ne.	43	e.	30	13	7	10	4.8	.0	.0	3
Providence [4]	159	46	60	29.94	30.12	+.05	63.3	+.1	86	1	72	40	19	54	36	53	81	1.24	−1.9	8	8.1	n.	23	sw.	16	8	8	14	5.9	.0	.0	3
Hartford [1]	159	5	44	29.93	30.11	+.04	63.0	+1.3	90	6	75	35	27	51	35	52	77	.65	−2.8	8	7.6	n.	21	s.	16	10	8	12	5.6	.0	.0	3
New Haven [1]	107	5	36	29.99	30.12	+.05	63.5	.0	86	7	74	37	27	53	35	53	75	1.22	−2.0	9	7.5	ne.	24	ne.	30	11	10	9	5.1	.0	.0	1
Middle Atlantic States							66.1	−1.0									75	2.14	−1.0										5.0			
Albany [1]	97	26	40	30.00	30.12	+.05	60.6	−.6	88	6	72	36	25	49	38	51	81	1.10	−1.7	8	6.2	s.	23	w.	16	10	12	8	5.4	.0	.0	2
Binghamton [2]	871	60	79	29.18	30.14	+.07	60.8	−.5	93	1	73	30	26	48	43	50	85	.39	−2.7	5	4.4	n.	16	sw.	9	8	13	9	5.3	.0	.0	0
New York	314	415	454	29.76	30.10	+.02	66.2	−.6	89	1	74	45	26	58	28	53	69	2.17	−1.2	8	11.6	e.	36	n.	16	12	6	12	5.0	.0	.0	2
Harrisburg [1]	374	30	49	29.71	30.12	+.04	64.8	−1.0	97	1	77	36	26	52	40	50	67	.85	−2.2	5	6.4	w.	23	n.	17	10	9	11	5.4	.0	.0	0
Philadelphia [1]	114	6	56	29.98	30.11	+.03	66.4	−1.6	95	1	77	43	26	56	34	54	72	1.69	−1.4	9	8.5	n.	31	ne.	30	8	11	11	5.6	.0	.0	2
Reading	323	47	306	29.76	30.12	.....	66.0	−.6	96	1	78	39	19	54	39	.....	.....	1.13	−2.1	3	9.2	nw.	37	ne.	30	10	11	9	5.0	.0	.0	0
Scranton	805	72	104	29.26	30.12	+.05	61.4	−1.5	91	1	73	34	26	50	39	.....	.....	.52	−2.6	6	5.3	n.	20	nw.	17	12	11	7	4.7	.0	.0	0
Atlantic City	52	37	172	30.03	30.09	+.02	65.8	−1.0	83	23	72	45	26	60	25	56	81	3.61	+1.0	11	15.7	s.	61	e.	30	12	5	13	5.4	.0	.0	0
Trenton	190	89	107	29.90	30.11	.....	65.6	−1.3	93	1	76	44	18	56	33	54	73	1.56	−1.8	7	7.8	n.	28	nw.	7	11	9	10	5.4	.0	.0	2
Baltimore [2]	123	100	215	29.97	30.11	+.03	68.5	.0	97	1	78	45	26	59	28	54	70	1.84	−1.5	8	9.5	nw.	28	n.	30	13	8	9	4.9	.0	.0	1
Washington [2]	112	56	100	30.04	30.11	+.03	67.6	−.5	97	1	78	43	26	58	32	55	71	2.88	−.4	9	6.2	n.	20	nw.	2	12	10	8	4.8	.0	.0	2
Cape Henry	18	8	54	30.04	30.07	.....	70.2	−1.6	94	1	76	47	26	64	24	61	78	3.07	+.2	8	13.7	n.	56	nw.	30	13	8	9	5.1	.0	.0	2
Lynchburg	686	144	184	29.38	30.12	+.04	67.4	−1.6	97	1	80	42	27	55	36	54	71	1.57	−1.7	6	5.7	nw.	24	n.	30	15	8	7	3.9	.0	.0	2
Norfolk [2]	91	80	125	29.99	30.09	+.03	70.8	−.8	97	2	78	51	27	64	24	61	82	6.08	+2.8	8	9.7	n.	33	nw.	30	11	10	9	5.5	.0	.0	3
Richmond	144	11	52	29.93	30.09	+.02	69.2	−1.3	99	1	80	45	26	58	34	56	72	3.60	+.4	9	7.4	n.	27	nw.	30	15	7	8	4.2	.0	.0	5
South Atlantic States							72.0	−1.3									77	2.95	−1.3										4.6			
Asheville	2,253	77	92	27.80	30.12	+.05	64.1	−.9	91	1	76	38	26	52	38	51	73	2.05	−1.0	5	6.4	nw.	17	sw.	6	12	9	9	5.0	.0	.0	0
Charlotte [2]	779	63	86	29.27	30.10	+.03	69.8	−1.7	95	2	80	48	26	60	31	57	74	5.13	+2.1	6	5.9	ne.	24	sw.	16	14	10	6	4.1	.0	.0	2
Greensboro [2]	886	6	56	29.18	30.12	.....	67.0	.....	92	2	79	41	27	55	37	56	78	2.80	.....	6	6.9	ne.	21	n.	30	16	7	7	3.9	.0	.0	2
Hatteras	11	5	50	30.04	30.06	.00	72.4	−2.1	87	7	77	56	27	68	15	66	83	3.27	−1.3	7	13.5	n.	38	n.	30	7	10	13	6.0	.0	.0	1
Raleigh [1]	376	27	69	29.70	30.10	+.03	69.2	−1.3	96	7	80	44	27	58	34	58	77	2.87	−.7	5	7.0	ne.	20	ne.	30	12	10	8	4.5	.0	.0	3
Wilmington	72	73	107	29.98	30.06	+.01	71.9	−1.2	90	7	80	50	26	63	28	62	79	2.20	−2.3	7	7.8	n.	21	s.	16	12	10	8	4.4	.0	.0	3
Charleston [2]	48	11	92	30.00	30.06	+.02	74.8	−1.8	92	7	82	58	30	68	22	64	85	2.41	−2.1	6	10.3	ne.	26	ne.	18	18	7	5	3.5	.0	.0	1
Columbia, S. C. [2]	347	70	91	29.71	30.09	+.04	72.2	−2.3	94	7	83	51	26	62	30	61	78	2.65	−.8	7	7.0	ne.	22	nw.	6	17	6	7	4.0	.0	.0	2
Greenville, S. C. [1]	1,040	18	36	29.00	30.10	.....	70.0	−.6	92	1	80	50	26	60	29	55	68	2.01	−1.7	4	8.3	ne.	23	ne.	18	15	9	6	4.1	.0	.0	1
Augusta [2]	182	62	77	29.87	30.07	+.02	73.6	−1.7	93	9	84	51	29	63	32	58	69	2.02	−1.3	6	5.1	ne.	20	ne.	12	13	10	7	4.3	.0	.0	2
Savannah [2]	65	73	152	29.98	30.05	+.02	76.4	+.2	94	7	85	59	27	68	26	66	81	.76	−4.6	3	8.5	ne.	29	e.	18	14	10	6	4.4	.0	.0	0
Jacksonville [3]	43	86	110	29.98	30.03	+.03	77.4	−.9	92	7	84	62	30	70	22	69	83	7.07	−.3	13	7.1	ne.	23	ne.	11	0	19	11	6.7	.0	.0	5
Florida Peninsula							81.6	+0.8									82	5.80	−1.4										6.0			
Key West [3]	21	10	64	29.92	29.93	+.01	83.6	+1.4	91	16	89	72	30	79	15	74	77	6.35	−.4	15	8.2	e.	26	sw.	5	6	17	7	5.5	.0	.0	9
Miami [3]	25	242	249	29.94	29.97	.00	80.3	+.2	87	22	85	70	27	76	14	73	85	5.98	−2.4	16	10.1	e.	33	e.	27	3	17	10	6.1	.0	.0	12
Tampa [1]	35	6	43	29.95	30.00	+.03	80.8	+.9	92	17	88	69	29	74	18	72	84	5.07	−1.4	12	9.4	e.	29	se.	4	3	19	8	6.5	.0	.0	12
East Gulf States							74.0	−1.7									78	4.70	+0.4										6.1			
Atlanta [1]	1,173	33	72	28.85	30.06	+.01	70.7	−2.1	94	1	80	52	26	61	31	57	71	2.37	−.7	8	7.9	ne.	26	sw.	2	9	8	13	5.7	.0	.0	3
Macon [2]	370	79	87	29.06	30.06	+.03	72.5	+.1	94	1	83	50	26	62	33	59	70	1.41	−1.8	6	6.3	ne.	19	nw.	16	14	10	6	4.2	.0	.0	2
Thomasville	273	49	58	29.75	.....	.....	75.8	−1.0	94	1	86	57	25	66	28	.....	.....	3.23	−1.6	7	.....	.....	.....	.....	.....	6	13	11	.....	.0	.0	5
Apalachicola	35	11	51	29.96	30.00	.....	77.6	−.9	94	8	84	64	25	71	22	70	81	6.57	−1.5	7	8.9	ne.	27	se.	4	4	12	14	6.7	.0	.0	10
Pensacola	56	54	79	29.96	30.02	+.03	77.0	−1.0	92	9	84	58	25	70	23	67	81	5.40	+.1	12	7.7	e.	22	se.	19	5	8	17	6.8	.0	.0	5
Anniston	741	9	.....	.....	.....	.....	70.6	−.7	92	3	82	42	25	59	35	.....	.....	3.19	−.5	9	.....	se.	.....	.....	.....	14	12	4	.....	.0	.0	.1
Birmingham [1]	700	5	62	29.33	30.07	+.04	70.8	−4.0	92	15	82	42	25	60	35	58	74	2.31	.....	9	7.6	e.	24	e.	18	9	6	15	6.1	.0	.0	5
Mobile [3]	57	86	161	29.96	30.02	+.02	75.7	−2.4	91	11	83	57	26	68	29	65	81	7.17	+2.2	10	6.7	n.	20	e.	18	7	7	16	6.5	.0	.0	10
Montgomery [2]	218	92	105	29.81	30.04	+.02	74.2	−2.1	91	2	83	54	25	65	26	61	73	2.12	−.9	10	6.2	e.	17	sw.	4	10	3	17	6.2	.0	.0	.0
Meridian [2]	375	67	92	29.65	30.05	+.03	73.4	−1.1	92	3	83	50	26	64	33	62	79	3.38	+.4	11	5.7	ne.	24	s.	4	9	11	10	5.6	.0	.0	4
Vicksburg [2]	247	82	102	29.77	30.03	+.01	74.0	−2.3	94	4	83	54	26	65	31	63	85	3.03	+.2	8	8.2	n.	22	n.	6	7	10	13	6.2	.0	.0	2
New Orleans [4]	53	50	84	29.94	30.00	+.02	76.2	−3.0	91	8	83	62	25	69	20	68	80	3.81	+8.8	13	7.4	ne.	19	ne.	16	5	10	15	6.8	.0	.0	7
West Gulf States							76.3	−1.2									75	5.32	+1.7										6.5			
Shreveport [1]	240	5	64	29.76	30.02	+.02	75.2	−.7	97	14	85	57	23	66	34	63	75	2.57	−.2	10	7.7	ne.	24	ne.	17	6	4	20	7.1	.0	.0	5
Fort Smith	463	57	82	29.54	30.01	.00	73.6	−.4	97	2	83	53	18	64	33	57	62	5.14	+2.2	7	6.8	e.	27	n.	6	6	16	8	5.9	.0	.0	4
Little Rock [1]	357	5	58	29.68	30.05	+.02	72.2	−1.9	98	1	83	50	25	62	34	59	72	2.19	−1.0	7	6.9	ne.	26	n.	6	6	8	16	6.9	.0	.0	6
Austin [1]	605	11	46	29.35	29.97	.....	76.4	−1.9	98	6	87	58	19	66	35	63	72	3.31	−.1	10	7.7	ne.	26	n.	16	7	10	13	6.0	.0	.0	6
Brownsville [1]	57	5	54	29.84	29.90	.....	80.9	+.3	96	6	89	65	20	73	24	72	84	7.27	+1.4	15	9.3	nw.	26	nw	17	1	13	16	7.3	.0	.0	1
Corpus Christi [1]	20	4	33	29.92	29.93	−.02	79.4	+.8	96	5	87	61	19	72	30	72	84	4.26	.....	13	11.4	e.	34	n.	17	6	9	15	6.7	.0	.0	5
Dallas [1]	512	5	45	29.46	29.99	.....	75.6	.....	98	14	86	57	18	66	32	62	67	5.19	+2.5	9	7.7	se.	29	ne.	2	10	9	11	5.7	.0	.0	5
Fort Worth [1]	679	5	56	29.30	30.00	+.01	76.2	+.3	98	14	86	56	18	66	32	60	66	7.31	+4.8	7	8.1	se.	29	ne.	6	9	6	15	5.9	.0	.0	5
Galveston [3]	54	106	114	29.90	29.96	−.02	76.8	−3.3	89	5	81	61	17	72	14	71	84	6.49	+.9	11	10.4	e.	38	ne.	16	5	12	13	6.6	.0	.0	3
Houston [2]	138	157	190	29.83	29.98	.....	76.3	−2.7	94	4	84	58	18	69	25	68	83	4.41	+.3	16	9.6	ne.	34	ne.	16	4	11	15	7.1	.0	.0	9
Palestine	510	64	72	29.49	30.01	+.02	75.6	−1.4	95	3	85	54	27	66	32	62	72	5.18	+2.3	9	6.2	ne.	21	e.	1	9	9	12	5.6	.0	.0	3
Port Arthur	34	59	134	29.94	29.98	.....	76.4	.....	92	3	83	60	17	70	24	68	81	10.50	+5.7	12	12.7	ne.	47	e.	16	5	6	19	7.0	.0	.0	7
San Antonio [1]	693	6	51	29.25	29.96	.00	76.4	−2.6	97	6	87	54	19	66	36	65	75	4.34	+1.3	11	8.2	ne.	34	ne.	9	5	11	14	6.6	.0	.0	7
Ohio Valley and Tennessee							65.6	−2.4									77	2.79	−0.2										5.2			
Chattanooga [1]	762	6	66	29.28	30.09	+.03	68.6	+.4	94	1	81	42	23	56	35	58	81	4.91	+1.8	8	5.3	ne.	36	nw.	15	10	8	12	5.5	.0	.0	6
Knoxville [1]	995	27	53	29.06	30.11	+.05	67.9	−2.7	96	1	79	44	25	57	33	56	75	3.51	+.8	9	6.1	ne.	45	w.	16	16	9	5	3.8	.0	.0	4
Memphis [1]	399	5	86	29.64	30.05	+.02	70.5	−3.1	99	1	81	48	20	60	31	60	77	5.56	+2.8	10	6.5	e.	25	nw.	15	6	11	13	6.3	.0	.0	8
Nashville [1]	546	5	72	29.50	30.08	+.02	68.8	−3.0	98	1	70	44	25	58	34	56	74	5.98	+2.6	10	6.9	n.	28	sw.	15	10	7	13	5.5	.0	.0	6
Lexington	989	6	.....	29.06	.....	.....	67.2	−1.3	99	1	81	40	24	53	38	.....	.....	1.86	−1.2	9	.....	s.	.....	.....	15	10	5	8.9	.0	.0	5

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station	Pressure: Sea level	Pressure: Departure from normal	Temperature of the air: Mean max. + mean min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Temperature of the air: Mean temperature of the dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
Ohio Valley and Tennessee—Continued	*Ft.*	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°*F.*	°*F.*	°*F*		°*F*	°*F*		°*F*	°*F*	°*F.*	%	*In.*	*In.*		*Miles*								*1–10*	*In.*	*In.*	
							65.6	**−2.4**									**77**	**2.79**	**0.2**										**5.2**			
Louisville [2]	525	106	120	29.54	30.10	+.04	67.4	−3.1	99	1	76	42	26	59	28	54	75	1.92	−.9	8	6.6	n.	26	sw.	6	7	12	11	5.9	.0	.0	3
Evansville [1]	431	12	40	29.62	30.10	+.04	65.3	−2.4	98	1	77	41	26	54	36	56	78	3.91	+.6	12	5.7	nw.	20	s.	5	7	11	12	5.8	.0	.0	4
Indianapolis [1]	823	5	54	29.22	30.10	+.04	61.8	−3.6	96	1	74	36	21	50	34	53	80	3.26	.....	8	8.0	sw.	28	w.	4	6	13	11	5.8	.0	.0	5
Terre Haute [2]	575	68	149	29.48	30.10	.....	64.7	.....	97	1	75	39	26	54	32	53	78	3.45	−.2	9	7.8	s.	22	w.	6	4	14	12	6.3	.0	.0	3
Cincinnati [2]	627	11	51	29.43	30.12	+.05	65.9	−1.2	100	1	78	40	26	54	40	54	80	1.65	−1.0	12	5.4	ne.	15	s.	4	11	7	12	5.4	.0	.0	4
Columbus [2]	822	90	110	29.24	30.12	+.05	64.6	−1.9	95	1	75	40	26	54	33	51	74	.95	−1.6	6	7.6	s.	32	sw.	6	12	9	9	5.0	.0	.0	2
Vandalia [1]	1,003	6	55	29.04	30.12	.....	63.6	−3.0	96	1	74	38	24	53	32	51	73	1.73	−1.2	10	8.8	s.	29	sw.	1	9	11	10	5.3	.0	.0	6
Elkins [2]	1,947	61	78	28.11	30.16	+.08	59.4	−3.6	88	6	72	34	27	47	39	51	91	2.30	−.8	7	3.8	w.	15	w.	9	14	5	11	5.1	.0	.0	2
Parkersburg	637	77	84	29.43	30.11	+.03	64.6	−2.7	95	1	77	38	27	52	40	53	76	.67	−2.1	7	4.3	se.	17	w.	9	17	6	7	3.6	.0	.0	3
Pittsburgh [1]	842	39	54	29.22	30.13	+.05	63.2	−1.8	93	1	74	41	18	53	32	48	67	.71	−1.9	7	8.5	s.	29	sw.	6	10	12	8	4.9	.0	.0	4
Lower Lake Region							**60.7**	**−1.7**									**78**	**2.52**	**−0.4**										**5.3**			
Buffalo [1]	768	34	96	29.28	30.11	+.05	60.8	−1.6	92	1	71	35	26	51	34	51	77	3.45	+.5	11	11.2	sw.	45	nw.	1	8	14	8	5.4	.0	.0	5
Canton	448	10	61	29.61	30.09	.....	57.0	−2.3	86	6	68	25	26	46	34	49	80	1.72	−1.6	7	6.9	sw.	29	sw.	27	6	13	11	6.1	.0	.0	4
Oswego	335	71	85	29.73	30.10	+.04	60.1	−1.1	88	1	68	36	26	52	30	50	74	1.77	−.9	9	8.1	se.	19	n.	21	9	15	6	5.0	.0	.0	2
Rochester [1]	523	5	69	29.54	30.12	+.06	60.6	+.1	93	1	71	34	26	50	39	50	80	1.82	−.6	11	7.6	se.	32	w.	1	6	14	10	5.5	.0	.0	2
Syracuse [1]	596	5	57	29.46	30.11	+.04	60.0	−.3	93	1	72	30	26	48	41	51	81	.51	−2.2	9	7.6	sw.	30	w.	1	5	16	9	5.7	.0	.0	2
Erie [2]	714	57	81	29.34	30.12	+.06	62.9	−.7	94	1	70	42	26	56	28	51	78	3.38	.0	10	7.4	w.	20	nw.	1	5	18	7	5.7	.0	.0	3
Cleveland [1]	762	27	54	29.29	30.12	+.06	62.6	−1.2	94	1	73	40	12	52	33	51	76	3.53	+.2	10	8.6	se.	30	sw.	6	10	10	10	5.0	.0	.0	4
Sandusky	629	5	67	29.42	30.12	+.06	63.0	−2.3	96	1	72	42	26	54	33	.....	.....	2.78	−.2	9	7.6	sw.	19	sw.	6	13	9	8	4.7	.0	.0	4
Toledo [1]	628	5	47	29.43	30.12	+.06	60.0	−4.4	94	1	72	35	24	48	34	52	83	1.85	−1.0	10	8.8	sw.	40	w.	1	15	11	4	3.9	.0	.0	2
Fort Wayne [1]	857	5	33	29.18	30.10	.....	59.9	−3.2	91	1	71	34	24	49	34	50	79	4.52	+1.5	10	6.3	sw.	26	w.	8	10	12	8	5.2	.0	.0	4
Detroit [1]	730	5	78	29.32	30.12	+.06	61.2	−1.2	96	1	71	37	18	52	28	50	74	2.35	−.6	9	8.4	sw.	33	w.	10	5	14	11	6.3	.0	.0	1
Upper Lake Region							**56.4**	**−2.7**									**79**	**1.57**	**−1.7**										**5.6**			
Alpena	609	5	89	29.41	30.08	+.05	55.7	−1.9	87	1	64	36	12	47	25	47	80	2.00	−1.0	9	9.8	nw.	28	sw.	7	10	7	13	5.5	.0	.0	3
Escanaba	612	51	72	29.39	30.07	+.06	54.0	−3.1	80	1	62	33	11	46	29	47	82	1.39	−1.9	9	10.0	s.	33	sw.	7	7	14	9	6.1	.0	.0	2
Grand Rapids [2]	707	70	244	29.33	30.10	+.05	60.6	−2.1	85	1	70	39	24	51	29	49	79	1.77	−1.8	10	10.2	sw.	43	sw.	7	10	14	6	5.3	.0	.0	6
Lansing [2]	878	5	90	29.15	30.11	.....	57.5	−3.9	86	1	68	33	24	48	28	49	81	3.45	+.5	12	6.9	sw.	23	w.	10	10	9	11	5.3	.0	.0	3
Ludington	637	60	66	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Marquette	734	44	70	29.23	30.04	+.04	54.3	−3.2	83	3	62	35	23	46	31	45	77	2.09	−1.2	10	8.6	sw.	34	s.	18	7	13	10	5.9	.0	.0	1
Sault Sainte Marie [1]	614	11	43	29.38	30.07	+.05	53.6	−.4	84	1	63	32	12	44	29	46	86	.86	−2.7	12	10.6	e.	48	sw.	7	7	11	12	6.2	.0	.0	2
Chicago [1]	673	5	36	29.36	30.09	+.05	61.6	−3.3	88	30	72	36	26	51	36	50	73	.92	−2.3	7	8.2	sw.	27	w.	8	6	16	8	5.6	.0	.0	1
Green Bay	617	109	14	29.40	30.06	+.04	56.6	−3.8	82	3	65	36	24	48	29	47	77	.81	−2.7	8	9.0	s.	29	sw.	7	8	13	9	5.6	.0	.0	3
Milwaukee [1]	681	33	66	29.35	30.09	+.06	58.0	−3.0	84	5	68	37	24	48	34	49	76	.37	−2.9	7	10.8	sw.	42	sw.	7	9	14	7	5.1	.0	.0	1
Duluth [2]	1,133	5	47	28.79	30.03	+.05	52.6	−2.5	78	5	62	33	23	43	30	43	83	2.00	−1.3	8	11.9	nw.	39	w.	7	7	11	12	5.8	.0	.0	2
North Dakota							**56.2**	**−0.8**									**64**	**0.38**	**−1.1**										**4.6**			
Fargo [1]	940	5	43	28.98	30.01	+.05	55.9	−2.3	83	29	68	29	20	44	39	44	71	.79	−1.4	8	13.6	s.	44	w.	7	10	10	10	5.3	.0	.0	6
Bismarck [1]	1,677	5	43	28.22	30.00	+.06	57.4	+.1	89	26	72	27	10	43	42	42	62	.23	−1.0	5	10.9	nw.	36	nw.	7	14	9	7	4.2	.0	.0	0
Devils Lake	1,478	11	44	28.41	29.99	+.05	55.0	−.9	85	28	68	28	10	42	42	40	65	.31	−1.3	5	9.3	nw.	34	nw.	7	11	11	8	4.8	.0	.0	0
Lemmon, S. Dak	2,620	4	38	.....	.....	.....	57.6	.....	90	13	73	31	19	42	41	.....	.....	.26	−.9	2	.....	nw.	.....	.....	.....	15	10	5	.....	.0	.0	2
Grand Forks [1]	832	4	41	.....	.....	.....	55.8	.....	85	29	69	28	25	42	42	43	.....	.15	.....	3	.....	nw.	.....	.....	.....	8	15	7	.....	.0	.0	1
Williston	1,878	42	50	28.01	29.99	+.06	56.6	.0	87	17	70	31	19	43	46	39	59	.32	−.8	5	7.1	nw.	28	nw.	7	14	10	6	4.2	.0	.0	1
Upper Mississippi Valley							**61.6**	**−3.6**									**76**	**2.26**	**−1.4**										**5.4**			
Minneapolis-St. Paul [1]	919	43	61	29.05	30.05	+.06	58.2	−2.2	86	27	68	34	17	48	32	48	76	2.47	−.7	12	9.7	nw.	34	w.	7	8	11	11	5.7	.0	.0	5
Springfield, Minn	1,020	4	42	28.95	30.05	.....	58.0	.....	84	2	69	34	17	47	32	47	74	4.19	.....	10	.....	se.	.....	.....	.....	8	12	10	.....	.0	.0	6
La Crosse [1]	714	5	29	29.29	30.06	+.05	57.1	−5.1	84	3	67	31	17	47	32	49	79	2.00	−2.0	10	7.9	s.	28	w.	7	5	16	9	5.6	.0	.0	3
Madison [2]	974	70	78	29.04	30.09	+.06	58.2	−4.2	82	3	66	40	26	50	26	49	79	2.89	−.8	8	7.3	nw.	19	s.	18	8	13	9	5.3	.0	.0	3
Charles City	1,015	10	51	29.01	30.10	+.07	57.6	−3.4	83	27	68	35	20	47	32	.....	.....	1.84	−1.8	8	5.6	se.	20	s.	18	14	7	9	4.7	.0	.0	4
Davenport [1]	606	6	50	29.43	30.10	+.07	61.2	−4.4	87	5	72	37	17	50	35	51	77	1.23	−2.4	5	8.1	e.	28	sw.	24	6	13	11	5.8	.0	.0	3
Des Moines [2]	860	5	99	29.14	30.07	+.05	61.2	−4.4	87	3	72	38	20	51	34	50	75	2.40	−1.3	9	8.2	se.	33	se.	12	12	11	7	4.7	.0	.0	5
Dubuque	699	81	96	29.33	30.08	+.05	60.2	−3.8	86	3	69	41	17	51	28	49	74	1.86	−2.2	10	5.3	s.	17	nw.	6	8	12	10	5.7	.0	.0	3
Burlington, Iowa [1]	707	6	35	29.32	30.08	+.05	62.8	−3.6	91	3	74	40	17	51	33	51	77	1.03	−3.4	5	7.6	nw.	30	w.	5	10	10	10	5.3	.0	.0	5
Cairo	357	5	99	29.70	30.07	+.02	68.6	−2.9	93	1	78	46	26	59	28	.....	.....	4.26	+1.4	13	6.3	ne.	24	s.	13	6	8	16	6.5	.0	.0	5
Peoria [1]	609	11	45	29.44	30.10	+.06	61.9	−2.4	89	5	73	39	17	51	35	51	75	.88	.....	6	8.3	s.	26	nw.	8	11	10	9	4.9	.0	.0	4
Springfield, Ill. [2]	636	5	191	29.40	30.09	+.04	65.2	−2.4	92	5	76	41	26	54	32	52	79	2.45	−1.2	7	9.7	s.	26	s.	12	6	11	13	6.0	.0	.0	4
St. Louis [2]	568	6	303	29.48	30.08	+.04	67.4	−3.1	90	3	76	48	26	59	27	54	75	2.40	−1.1	7	9.6	s.	25	s.	5	10	10	10	5.2	.0	.0	5
Missouri Valley							**63.8**	**−2.3**									**68**	**2.59**	**−0.5**										**4.4**			
Columbia, Mo. [2]	784	6	66	29.23	30.07	+.04	65.4	−2.8	93	5	76	41	24	54	32	53	74	4.84	+.5	11	6.4	s.	23	nw.	5	9	16	5	4.5	.0	.0	6
Kansas City [1]	963	38	76	29.04	30.06	+.04	66.3	−2.6	93	4	77	44	17	56	36	52	67	2.28	−1.5	7	8.6	ne.	40	nw.	5	12	12	6	4.5	.0	.0	6
St. Joseph [2]	967	11	49	29.04	30.06	.....	65.1	−3.3	91	5	76	42	17	54	32	52	70	2.78	−1.1	11	7.3	se.	35	nw.	5	23	2	5	3.0	.0	.0	5
Springfield, Mo. [1]	1,324	5	60	28.68	30.06	+.03	65.1	−3.3	94	3	76	42	9	54	35	54	74	5.78	+2.3	15	8.6	se.	35	n.	12	6	11	13	6.2	.0	.0	6
Topeka	987	65	87	29.00	30.04	.....	66.7	−2.0	93	4	78	44	17	55	36	52	68	4.00	+.2	10	7.6	s.	27	s.	11	13	11	6	4.4	.0	.0	10
Lincoln [2]	1,189	11	81	28.79	30.04	+.05	65.4	−1.0	95	5	78	37	20	53	37	47	65	1.14	−1.8	6	8.2	se.	43	w.	5	15	6	9	4.7	.0	.0	4
Omaha [1]	1,105	5	68	28.89	30.07	+.07	63.6	−2.1	90	5	75	35	20	52	40	49	68	.74	−2.5	6	9.8	se.	34	nw.	5	11	12	7	4.4	.0	.0	4
Valentine	2,598	46	54	27.34	30.04	+.08	60.4	−2.1	89	18	74	32	9	47	48	41	35	.96	−.3	4	9.3	s.	33	sw.	17	19	8	3	3.1	.0	.0	2
Sioux City [1]	1,138	64	106	28.84	30.06	+.08	60.9	−1.6	90	5	73	33	20	48	38	48	69	2.50	−.5	6	9.7	s.	42	sw.	5	7	15	8	5.0	.0	.0	5
Huron [1]	1,301	5	41	28.65	30.04	+.08	59.3	−2.0	92	2	73	32	20	45	40	45	66	.85	−.7	4	13.3	s.	40	s.	17	13	11	6	4.7	.0	.0	4
Northern Slope							**59.1**	**+1.5**									**51**	**0.34**	**−0.9**										**3.5**			
Billings [1]	3,570	24	39	26.38	30.01	.....	60.2	.0	89	17	75	30	19	45	42	38	49	.55	.....	7	10.2	sw.	38	n.	6	16	7	7	4.2	.0	.0	2
Havre	2,507	11	67	27.40	30.02	+.08	57.4	+1.0	90	17	74	30	19	40	51	33	45	.14	−1.2	5	7.7	nw.	30	sw.	17	17	8	5	3.7	.0	.0	0
Helena [1]	4,124	5	35	25.88	30.05	+.08	57.6	+2.2	87	12	75	26	19	40	46	37	52	.78	−.5	3	7.5	w.	35	nw.	17	17	8	5	3.4	T	.0	0
Missoula [2]	3,205	80	91	26.70	30.05	.....	61.0	+5.6	88	12	77	36	19	45	44	38	51	.05	−1.4	3	6.7	e.	36	e.	6	21	5	4	2.6	.0	.0	0
Kalispell	2,973	48	56	26.98	30.01	+.05	56.6	+3.1	86	13	72	30	19	42	42	38	55	.23	−1.0	4	5.6	w.	21	ne.	6	18	9	3	3.2	.0	.0	0
Miles City [1]	2,371	5	28	27.54	30.02	+.07	58.6	−2.6	93	17	75	29	19	42	46	37	51	.31	.....	3	.....	nw.	.....	.....	.....	15	7	8	4.1	.0	.0	1
Rapid City [1]	3,259	5	63	26.69	30.02	+.06	60.4	.0	96	17	76	34	6	45	54	35	47	.32	−.9	1	14.1	nw.	42	nw.	18	17	7	6	3.6	.0	.0	1
Cheyenne [1]	6,094	5	40	24.11	30.00	+.04	57.5	+.5	86	13	75	30	6	40	49	36	51	.53	−.7	4	9.3	nw.	45	sw.	18	17	10	3	3.3	.0	.0	3
Lander	5,352	60	68	24.76	30.01	+.05	58.5	+2.8	88	13	75	31	6	42	46	37	50	.49	−.4	4	4.4	sw.	25	w.	2	15	13	2	3.4	.0	.0	4
Sheridan [1]	3,790	5	38	26.19	30.04	.....	59.0	+2.7	92	17	76	30	19	43	46	37	52	.34	−.9	4	7.2	nw.	34	nw.	5	13	14	3	3.7	.0	.0	2
North Platte [2]	2,821	11	51	27.13	30.03	+.06	63.0	+.9	93	2	78	37	20	48	48	44	62	.21	−1.1	6	7.5	s.	22	s.	26	16	11	3	3.4	.0	.0	7
Middle Slope							**67.6**	**−1.1**									**58**	**2.40**	**+0.2**										**4.4**			
Denver [2]	5,292	106	113	24.83	29.99	+.03	63.2	+.3	87	2	77	40	20	49	41	35	42	.21	−.8	2	6.9	s.	35	n.	5	22	6	2	2.6	.0	.0	2
Pueblo [1]	4,639	5	36	25.36	29.98	+.02	63.7	−.9	92	11	81	34	20	46	47	40	52	.61	−.1	4	7.2	nw.	36	n.	5	12	15	3	4.1	.0	.0	8
Concordia	1,392	50	58	28.59	30.05	+.06	66.2	−2.1	95	5	79	38	20	54	40	48	61	2.36	−.2	8	7.0	s.	24	s.	11	13	12	5	4.5	.0	.0	5
Dodge City [1]	2,509	5	58	27.44	29.99	+.01	67.2	−2.2	93	5	80	40	20	54	40	49	61	.83	−1.1	4	14.5	s.	47	n.	5	12	12	6	4.4	.0	.0	4
Wichita [1]	1,358	6	64	28.61	30.02	+.02	68.7	−1.9	91	5	80	49	24	57	36	52	63	3.14	.0	9	12.4	s.	48	s.	11	13	9	8	4.8	.0	.0	7
Oklahoma City [2]	1,214	10	47	28.74	30.00	+.01	74.2	+1.4	95	5	86	54	24	62	33	54	59	2.87	−.2	6	7.8	s.	26	s.	31	11	10	9	5.0	.0	.0	5
Tulsa [1]	674	10	61	29.32	30.02	.....	70.4	−2.5	93	12	82	49	18	58	36	56	68	6.80	+3.8	10	9.3	s.	40	ne.	6	11	8	11	5.2	.0	.0	8

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments: Barometer above sea level	Elevation of instruments: Thermometer above ground	Elevation of instruments: Anemometer above ground	Pressure: Station	Pressure: Sea level	Pressure: Departure from normal	Temperature of the air: Mean max. + min. ÷ 2	Temperature of the air: Departure from normal	Temperature of the air: Maximum	Temperature of the air: Date	Temperature of the air: Mean maximum	Temperature of the air: Minimum	Temperature of the air: Date	Temperature of the air: Mean minimum	Temperature of the air: Greatest daily range	Temperature of the air: Mean temperature of dew-point	Mean relative humidity	Precipitation: Total	Precipitation: Departure from normal	Precipitation: Days with 0.01 inch or more	Wind: Average hourly velocity	Wind: Prevailing direction	Wind: Maximum velocity: Miles per hour	Wind: Maximum velocity: Direction	Wind: Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Ft.	*Ft.*	*Ft.*	*In.*	*In.*	*In.*	°*F.*	°*F.*	°*F*		°*F*	°*F*		°*F*	°*F*	°*F.*	%	*In.*	*In.*		*Miles*								*1–10*	*In.*	*In.*	
Southern Slope							**73.6**	**+0.1**									**62**	**1.36**	**−1.2**										**5.4**			
Abilene [1]	1,738	10	52	28.20	29.97	+.01	76.6	+1.3	98	5	89	53	18	64	38	57	63	1.37	−1.3	6	7.8	s.	27	sw.	5	11	8	11	5.2	.0	.0	4
Amarillo [1]	3,676	10	42	26.33	29.98	+.02	69.0	−.3	97	5	82	46	20	56	30	49	58	.70	−1.5	2	14.3	s.	48	ne.	6	13	8	9	4.9	.0	.0	3
Del Rio	960	63	71	28.96	29.93	−.01	77.6	−1.6	98	6	86	50	27	69	30	65	72	2.47	−.5	9	7.3	e.	50	se.	15	6	6	18	6.7	.0	.0	4
Roswell	3,366	75	85	26.41	29.95	+.03	71.2	+.9	96	5	85	50	21	58	40	45	53	.79	−1.3	5	7.5	s.	29	ne.	30	14	7	9	4.7	.0	.0	2
Southern Plateau							**78.3**	**+3.4**									**42**	**1.18**	**+0.5**										**3.1**			
El Paso [1]	3,778	5	85	26.10	29.87	+.01	74.8	+1.5	98	12	86	53	19	61	37	47	46	1.36	+.1	5	8.6	e.	29	n.	2	15	7	8	4.5	.0	.0	1
Albuquerque [1]	5,314	5	48	24.81	29.90	.....	70.2	+2.3	92	12	83	50	28	57	35	42	43	.35	−.4	5	9.1	se.	39	se.	15	15	7	8	4.3	.0	.0	4
Phoenix [1]	1,107	35	87	28.67	29.77	−.04	85.6	+2.9	108	12	100	60	27	71	37	53	44	.97	+.2	4	5.2	e.	32	e.	25	21	5	4	2.2	.0	.0	4
Tucson [1]	2,555	6	30	27.28	29.81	.....	82.0	.....	105	12	96	60	27	68	36	51	41	3.51	+2.4	6	.....	se.	.....	.....	.....	16	9	5	3.8	.0	.0	5
Yuma	142	9	54	29.62	29.75	−.03	88.8	+5.1	112	12	105	66	26	73	39	61	48	.04	−.3	1	4.5	sw.	21	nw.	25	27	2	1	.9	.0	.0	1
Independence	3,957	5	26	26.00	29.95	+.01	73.3	+5.3	94	6	90	51	17	57	40	38	27	.85	+.8	1	.....	n.	.....	.....	.....	26	3	1	.....	.0	.0	1
Middle Plateau							**66.6**	**+4.6**									**37**	**0.16**	**−0.5**										**2.1**			
Reno [1]	4,227	20	52	25.50	29.95	.00	64.0	+3.5	94	9	88	33	19	40	57	36	49	T	−.3	0	5.0	n.w.	26	n.w.	24	26	3	1	1.0	.0	.0	2
Tonopah [1]	6,090	9	20	24.12	29.91	.....	69.0	+5.8	86	7	80	51	27	58	33	30	27	.03	−.3	1	.....	n.w.	.....	.....	.....	25	3	2	.....	.0	.0	0
Winnemucca	4,339	5	56	25.65	29.94	+.01	66.2	+7.0	94	10	87	38	17	45	52	30	31	T	−.4	0	6.8	n.e.	21	s.w.	17	25	4	1	1.1	.0	.0	0
Modena	5,473	10	46	24.68	29.92	.00	63.3	+3.3	88	7	81	37	20	46	46	.....	.....	.61	−.2	3	8.7	w.	31	s.	15	20	4	6	3.2	.0	.0	4
Salt Lake City [1]	4,227	32	46	25.65	29.94	−.01	67.6	+4.9	92	15	84	42	20	52	41	38	39	T	−1.0	0	7.9	s.e	24	s.w.	17	21	6	3	2.6	.0	.0	1
Grand Junction	4,602	60	68	25.42	29.95	.00	69.4	+3.2	90	15	84	48	20	55	36	38	38	.31	−.6	5	5.9	s.e.	28	s.w.	18	21	7	2	2.6	.0	.0	5
Northern Plateau							**65.2**	**+5.2**									**46**	**0.07**	**−0.7**										**2.4**			
Baker [2]	3,471	36	54	26.50	30.03	+.04	62.0	+6.0	90	25	81	31	19	47	45	38	55	T	−.7	0	6.1	s.	17	s.w.	17	22	8	0	1.8	.0	.0	2
Boise [1]	2,739	5	49	27.16	29.94	−.03	66.6	+5.4	93	16	82	38	19	51	38	40	40	T	−.3	0	8.7	s.e.	29	n.w.	2	24	5	1	1.8	.0	.0	0
Pocatello [1]	4,478	5	31	25.52	29.97	+.01	62.9	+3.6	90	11	81	35	6	45	48	34	41	.28	−.5	2	8.0	s.w.	29	s.w.	18	20	7	3	2.7	.0	.6	3
Spokane [1]	1,929	27	42	28.00	30.00	+.02	62.6	+3.4	91	12	79	35	19	46	43	39	46	.12	−.8	2	6.0	n.e.	26	n.w.	17	22	3	5	3.0	.0	.0	0
Walla Walla	991	57	65	28.94	29.98	−.02	68.9	+5.1	93	10	82	48	28	56	33	.....	.....	T	−1.0	0	4.9	s.	18	s.	17	23	5	2	1.8	.0	.0	0
Yakima	1,076	58	67	.....	.....	.....	68.5	+7.4	95	12	85	44	19	54	42	.....	.....	T	−.5	0	5.6	n.w.	24	n.w.	4	21	3	6	3.2	.0	.0	0
North Pacific Coast Region							**63.5**	**+4.2**									**71**	**0.47**	**−1.7**										**4.1**			
North Head	211	5	56	29.82	30.03	.00	58.7	+2.2	89	23	64	49	14	53	30	53	86	.48	−2.5	7	12.3	n.	47	s.	25	12	6	12	5.5	.0	.0	0
Seattle [2]	125	90	321	29.91	30.04	+.03	63.4	+3.1	86	8	72	48	28	54	29	50	70	.12	−1.6	2	7.8	n.	26	s.w.	19	15	6	9	4.1	.0	.0	0
Tacoma	194	172	201	29.84	30.03	+.01	61.0	+3.7	83	8	70	45	28	52	29	.....	.....	.34	−1.8	4	7.3	n.	27	s.w.	20	16	8	6	3.8	.0	.0	0
Tatoosh Island	86	9	61	29.97	30.05	+.04	55.8	+2.8	78	7	61	46	21	51	25	51	87	1.97	−2.7	13	13.0	e.	41	e.	7	7	5	18	6.6	.0	.0	0
Medford [1]	1,329	29	58	28.57	29.93	.....	70.9	+7.4	102	8	91	43	28	51	49	46	50	.04	−.6	1	.....	s.	.....	.....	.....	22	6	2	2.3	.0	.0	2
Portland, Oreg. [2]	154	68	106	29.85	30.00	−.03	67.8	+6.1	92	24	79	49	28	57	32	52	67	.09	−1.9	1	5.6	n.w.	20	e.	23	15	11	4	3.4	.0	.0	0
Roseburg	510	45	76	29.44	29.97	−.05	67.2	+4.3	100	23	83	44	29	51	50	51	64	.23	−1.0	4	3.7	n.	15	n.	21	21	6	3	3.0	.0	.0	1
Middle Pacific Coast Region							**68.4**	**+3.5**									**62**	**0.01**	**−0.6**										**3.3**			
Eureka	60	72	88	29.93	29.98	−.03	57.6	+1.7	72	23	63	48	28	52	17	53	85	.01	−1.0	1	5.2	sw.	17	sw.	23	8	8	14	6.0	.0	.0	0
Redding [1]	722	20	34	29.12	29.87	.....	79.5	+6.0	104	22	93	57	26	66	34	42	31	.00	−.8	0	7.3	nw.	22	n.	19	25	5	0	1.6	.0	.0	0
Sacramento	66	92	115	29.81	29.86	−.03	73.1	+3.8	101	23	89	50	18	57	41	51	55	T	−.4	0	6.7	s.	17	sw.	8	26	4	0	1.0	.0	.0	0
San Francisco [2]	155	112	132	29.76	29.92	−.02	63.4	+2.5	96	21	70	52	4	57	32	53	78	.02	−.4	2	8.9	w.	26	w.	1	11	11	8	4.6	.0	.0	0
South Pacific Coast Region							**71.7**	**+2.0**									**65**	**0.01**	**−0.1**										**2.3**			
Fresno [1]	327	5	35	29.52	29.84	−.03	75.8	+3.8	103	23	93	54	13	58	41	52	50	.00	−.2	0	5.3	nw.	17	nw.	26	24	5	1	1.2	.0	.0	0
Los Angeles	338	223	250	29.53	29.88	.00	70.6	+1.6	103	22	82	54	15	59	39	55	65	T	−.2	0	5.3	w.	17	w.	22	23	6	1	2.4	.0	.0	0
San Diego [1]	87	20	53	29.79	29.87	−.02	68.7	+.5	85	11	76	56	17	61	21	61	80	.04	.0	1	6.8	w.	17	w.	10	19	10	1	3.4	.0	.0	0
West Indies																																
San Juan, P. R.	82	9	54	29.85	29.95	.....	80.9	+.4	91	25	86	73	16	76	15	75	80	4.35	−1.6	18	9.1	e.	26	e.	16	3	22	5	5.6	.0	.0	9
Panama Canal																																
Balboa Heights	118	6	92	.....	[3] 29.82	.00	80.6	+.8	91	16	88	71	16	74	20	.....	[3] 85	7.88	−.4	21	4.6	nw.	22	n.	15	1	18	11	6.9	.0	.0	12
Cristobal	27	47	97	.....	[3] 29.83	.00	82.1	+1.7	91	18	88	74	2	76	15	75	[3] 84	10.51	−2.2	23	5.9	s.	25	ne.	13	0	4	26	8.5	.0	.0	19
Alaska																																
Anchorage	132	5	22	.....	29.63	.....	46.0	−1.8	63	3	53	31	23	39	...	41	81	3.97	+1.4	18	4.4	ne.	18	s.	13	0	4	26	.....	.0	.0	0
Fairbanks [1]	455	4	63	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Juneau [1]	80	6	21	.....	29.92	.....	49.6	.....	62	25	54	33	10	45	...	46	86	11.24	.....	26	10.5	e.	35	e.	28	0	3	27	.....	.0	.0	0
Nome	22	25	56	.....	29.66	.....	39.0	−2.7	59	1	46	19	25	32	...	.....	78	.39	−2.3	6	9.2	n.	29	s.	15	0	13	17	.....	T	.0	0
Hawaiian Islands																																
Honolulu	38	86	100	29.94	29.97	.....	79.0	+.8	85	24	84	70	22	74	14	.....	.....	.38	−.9	9	9.2	ne.	21	ne.	17	17	11	2	3.8	.0	.0	0

LATE REPORTS FOR AUGUST 1943

Alaska																															
Anchorage	132	5	22	29.64	29.78	.....	53.6	−2.0	75	4	62	39	28	46	26	48	78	3.27	+0.7	19	4.7	nw.	23	s.	10	1	10	20	8.2	.0	.0	0
Bethel	28	7	31	29.75	29.79	.....	51.0	−1.6	73	3	56	35	24	46	23	47	84	5.00	+1.0	24	.....	sw.	.....	.....	.....	0	2	29	9.6	.0	.0	0
Gambell	32	5	32	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ketchikan	75	69	90	29.94	29.96	.....	56.8	−1.6	80	5	62	47	31	51	27	52	85	11.23	−.2	23	6.9	se.	21	se.	26	4	2	25	8.3	.0	.0	0
Kotzebue	20	5	31	29.70	29.71	.....	49.4	−.7	64	3	54	34	19	45	15	46	86	1.84	+.7	15	.....	w.	.....	.....	.....	0	6	25	8.5	.0	.0	0
McGrath	331	5	31	29.42	29.79	.....	51.4	.....	77	3	59	33	24	44	26	46	81	4.44	+1.5	23	.....	s.	19	sw.	12	0	9	22	8.3	.0	.0	0
Northway	.....	5	32	27.96	.....	.....	52.9	.....	77	4	62	31	17	44	32	43	74	2.57	.....	17	.....	nw.	.....	.....	.....	3	6	22	7.7	.0	.0	0

[1] Data are airport records.
[2] Barometric data (adjusted to old city elevation) and hygrometric data from airport; otherwise city office records.
[3] Observations taken bihourly.
[4] Pressure (adjusted to old city elevation) temperature and hygrometric data from airport; otherwise city office records.
[5] Temperature and precipitation from city office records, other data from airport.

NOTE.—Except as indicated by notes 1, 2, 4, and 5 data in table are city office records.

SEVERE LOCAL STORMS, AUGUST 1943

LATE REPORTS FOR AUGUST 1943

(Compiled by Mary O. Souder)

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Bena, Minn., and vicinity	1	7 p. m.	[1] 8		$2,000	Thunderstorm and hail.	Property damage, $1,000; loss in growing crops, $1,000.
Glenwood, Minn., vicinity of	1	P. m.		1	5,000	Thundersquall	Barn demolished; 3 persons injured; loss in growing crops; property damage, $5,000.
Rock and Nobles Counties, Minn.	11	A. m.	[1] 2		35,000	Hail	Loss in growing crops, $11,000; property damage, $24,000; path 15 miles long.
Angus, Minn., and vicinity	12	8:15 p. m.	[1] 4		11,000	do	Loss in crops, $10,000; property damage, $1,000. Storm moved from southwest to northwest over a path about 10 miles long.
Nobles, Jackson, and Martin Counties, Minn.	15	2 a. m.	[1] 1		35,000	do	Loss in growing crops, $35,000; small property damage. Storm moved from northwest to southeast over a path about 15 miles long.
Nobles, Jackson, and Martin Counties, Minn.	15	do	[1] 5		24,000	Thundersqualls	Property damaged, $20,000; loss in growing crops, $4,000. Storm moved from northwest to southeast over a path about 20 miles long.
Polk County, Minn., northern portion.	21	7:45 p. m.	[1] 10		10,000	Thunderstorm and hail.	Loss to growing crops, $9,000; property damage, $1,000. Some poultry perished. Storm moved from southwest to northeast over a path 20 miles long.
Barnesville, Minn., vicinity of.	22	5:45 p. m.	880	0	10,000	Small tornado	Some farm buildings demolished; 6 boxcars unroofed; grain shocks and haystacks scattered; poles and wires down; trees uprooted; growing crops damaged. Storm moved from northwest to southeast over a path about 10 miles long. Property damage, $10,000.
Springfield, Minn., vicinity of.	22	10:50 p. m.		0	35,000	Possible small tornado	A number of barns, outbuildings, garages, silos, windmills, a night club, and an automobile wrecked. Poles and wires down, 2 horses killed, farm machinery damaged, trees uprooted, and loss in growing crops. $35,000, property damage.
Springfield, Minn., vicinity of.	22	do			23,000	Hail	Loss to growing crops, $20,000; property damage, $3,000.
Pipestone, Minn., and vicinity.	29	2 a. m.			30,000	do	Loss to growing crops in Pipestone County, $25,000; property damage, $5,000. Storm moved from southwest to northeast.
Minnesota, extreme southeastern counties.	31	8:20–11 p. m.			40,000	Thundersqualls	General direction of the storm from northwest to southeast over a path about 130 miles long. Property damage, $40,000; loss in growing crops not estimated; 3 persons injured.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, SEPTEMBER 1943

[Compiled by Mary O. Souder]

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Le Center, Minn., vicinity of	2	8:45 p. m., central war time.	440		$5,000	Thundersquall	Large barn demolished, killing 4 horses, some calves, and a number of hogs; house damaged; several poles and wires down; trees uprooted. Property damage, $5,000; small loss to growing crops; path 1 mile long.
Edwards and Ford Counties, Kans.	3	6–9 p. m., central war time.	[1] 3			Heavy hail and rain	Hail fell southwest of Kinsley. Stones ranged from size of marbles to 8 inches in circumference, with comparatively small damage. Torrential rains at about the same time caused destructive flooding, especially at Kinsley. Path 6 miles long.
Durham, Okla	4				9,000	Hail	Loss in crops, $8,000, mostly to sorghums and other food crops and cotton; damage to buildings approximately $1,000.
Calhoun and Greene Counties, Iowa.	4	4:30–6 p. m.	[1] 2		50,000	Wind and hail	Loss in crops up to 75 percent; chickens killed; property damaged; path 6 miles long.
Cottonwood and Brown Counties, Minn.	5	2:30 p. m., central war time.			50,000	Hail	Moderate to heavy hail caused $40,000 loss to growing crops and $10,000 damage to property.
Do	5	do	220	0	100,000	Small tornado	Many farm buildings demolished; houses damaged; poles and wires down; trees uprooted; grain in shock and haystacks scattered; growing crops damaged. Two funnel clouds observed southwest of Jeffers, which lifted before reaching the town. At one place a truck was picked up and put down in the same place, but facing in the opposite direction. Timbers from a barn were found driven through the south side of a house. Heavy rain and hail accompanied the storm. General direction of this storm from south-southwest to east-northeast over a path 25 miles long.
Lincoln, Nebr	5	3:50–4 p. m., central standard time.	[1] 2	1	2,150	Straight-line wind	Damage to carnival equipment and roofs of buildings.
Ashland, Va., vicinity of	7	3:30 p. m.	880		40,000	Wind	Several farm buildings destroyed, including a large dairy barn in which about 40 fine dairy cattle were killed; 1 person injured; path 3 miles long.
Osage and Douglas Counties, Kans.	11	4:45–5:30 a. m., central war time.	[1] 2–3		5,000	Heavy hail	Grain sorghums and soybeans badly damaged. Roofs and automobiles damaged. Some hailstones did not melt until noon. Path 12 miles long.
Blaine County, Okla	11			1	10,000	Heavy straight-line wind and hail.	In Canton a boy, blinded by the storm, was killed by contact with a high-voltage wire which had blown down. Loss in crops and property damaged.
Buffalo, Okla	11		[1] 2		6,000	Hail	$5,000 loss in sorghums and other feed crops; $1,000 other damage; path 10 miles long.
Lyon, Emmet, O'Brien, Greene, Guthrie, and Adair Counties, Iowa.	11–12					do	Scattered hail damage occurred in the counties named. In Lyon: County tomato and truck crops were destroyed and other crops: damaged in an area from ½ to 2 miles wide and from 6 to 8 miles long. Hail stripped leaves from corn and soybeans and badly damaged gardens in an area stretching from near Jefferson, in Green County, to Bagley and Bayard, in Guthrie County, about 12 miles to the south. Details are lacking from other areas.

SEVERE LOCAL STORMS, SEPTEMBER 1943—Continued

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Miami, Okla.	12				750	do	Loss in crops, $500; other damage, $250.
Burnett, Wis., vicinity of	27	10:45–11:30 a. m.			8,000	Electrical	Barn filled with grain and hay burned; 4 cattle killed.
Cape Charles, Va., vicinity of	30			1		Wind	1 ship was lost and several small craft sunk at their moorings.

CORRECTION FOR JULY 1943

[Storm tabulated as of July 26, in Lawrence County, Kans., should have been *Lawrence County, Ind.* There was no storm in Kansas on July 26, 1943]

Lawrence County, Ind.	26	3 a. m.	880		500	Wind	Trees and poles down.

[1] Miles instead of yards.

SOLAR RADIATION AND SUNSPOT DATA FOR SEPTEMBER 1943

[Solar Radiation Investigation Section, I. F. HAND in charge]

SOLAR RADIATION OBSERVATIONS

Explanations of the tables and references to descriptions of instruments, stations, and methods of observation, and to summaries of data, are given in the January 1942 REVIEW, page 20; a list of pyrheliometric stations is also given in the REVIEW for January 1943, page 12.

TABLE 1.—*Solar radiation intensities during September 1943*

[Gram-calories per minute per square centimeter of normal surface]

Madison, Wis.

Date	Sun's zenith distance: 7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mb.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*
September 1	21.8	0.33	0.51	0.75	1.13	1.35					17.0
September 2	14.2	.62	.88	.94	1.13	1.36					16.5
September 3	13.7	.50	.62	.71	.87						20.4
September 7	10.2	.71	.81	.91							10.6
September 8	9.8	.71	.81	.98	1.18						9.1
September 11	6.6	.73	.84	.99	1.19	1.39					7.2
September 17	7.2	.87	.98	1.11	1.24	1.39					8.1
September 18	8.7		.77	.92	1.13	1.33					9.4
September 20	7.8	.83	.94	1.08	1.24	1.51					8.1
September 22	11.8	.70	.83	.98	1.18	1.48					9.8
September 23	7.4	.87	.98	1.11	1.22	1.50					7.8
September 27	10.2	.35	.41								15.2
September 29	11.4			.52	.83	1.34	0.98				13.7
Means		.66	.78	.92	1.12	1.41	(.98)				
Departures		−.09	−.09	−.08	−.03	+.02	−.17				

Lincoln, Nebr.

September 6	10.6			1.18	1.38	1.52	1.25	1.10	1.01	0.88	6.9
September 7	8.7							1.08	.97	.83	9.4
September 8	7.7			1.16	1.34		1.23				7.7
September 9	6.9			1.09				1.17		.73	7.2
September 10	11.4					1.30	1.06	.84	.69	.60	12.2
September 11	13.2			.81	1.01	1.30					15.3
September 14	11.8			.98	1.20		1.01	.79	.62	.52	12.7
September 20	6.3		0.77	.85	1.27						5.5
September 21	8.0					1.45	.88		.56	.50	14.2
Means			(.77)	1.01	1.24	1.39	1.09	1.00	.77	.81	
Departures			−.07	+.04	+.10	−.03	−.07	+.02	−.06	−.04	

* Extrapolated.

TABLE 1.—*Solar radiation intensities during September 1943*—Con.

[Gram-calories per minute per square centimeter of normal surface]

Blue Hill, Mass.

Date	Sun's zenith distance: 7:30 a. m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	1:30 p. m.
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mb.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mb.*
September 6	22.9							0.51	0.39	0.33	25.9
September 7	25.0						0.89	.79			24.2
September 9	15.9	0.69	0.77	0.89	1.05		.74				17.6
September 10	13.7			.68		1.45					11.0
September 11	12.7	.71	.78		1.03						10.2
September 12	7.8			1.06		1.43	1.25	1.09	.97	.87	7.2
September 13	8.4	.90	.99	1.11	1.22	1.45	1.24	1.11	.99	.88	8.4
September 14	12.7	.91		1.10							11.0
September 16	17.0	.40	.54	.72	.90						18.3
September 18	6.9			1.09	1.20	1.49	1.20	1.08	.97	.87	6.9
September 19	7.8	.89	1.00	1.12	1.27	1.44	1.21	1.05			7.8
September 23	15.4						1.05	.81		.54	11.4
September 26	6.6						1.29	1.14	1.03		5.8
September 27	6.4	.77	.89	1.00	1.19	1.34	1.13				8.1
September 28	9.4	.62	.71	.86	1.06			.68	.51	.40	9.4
Means		.74	.81	.96	1.12	1.43	1.11	1.03	.81	.65	
Departures		−.05	−.09	−.05	−.01	+.06	−.02	+.09	+.02	−.01	

Albuquerque, N. Mex.

September 1	7.1					1.48	1.36	1.27	1.16	1.05	5.4
September 5	8.1				1.27	1.47					6.8
September 6	6.8	0.88	1.00	1.11	1.25	1.47	1.25	1.10	1.01	.88	6.8
September 7	6.8	.85	.98	1.12	1.27	1.49	1.26	1.09	.97	.84	6.1
September 9	10.2	.51			.92						10.8
September 10	12.9							1.01	1.88	.77	9.1
September 11	9.1	.76			1.17						7.1
September 15	10.5				1.21	1.38					9.1
September 16	7.8		.93	1.05	1.22	1.54					6.8
September 17	9.8	.84	.93	1.04	1.20		1.17				8.5
September 20	9.1		.75	.91	1.13	1.46	1.25	1.04	.89	.81	8.8
September 21	6.8	1.17	1.21	1.28	1.36						6.1
September 29	11.8	.92	1.02								10.8
September 30	10.2	.83	.93	1.06							9.1
Means		.84	.97	1.08	1.20	1.49	1.26	1.10	.98	.87	
Departures		−.02	−.01	−.01	+.04	+.01	−.01	+.01	.00	−.03	

TABLE 2.—*Daily totals and weekly means of solar radiation (direct+diffuse) received on a horizontal surface*

[Gram-calories per square centimeter]

Date	Washington	Madison	Lincoln	East Lansing	New York	Fairbanks	Nashville	Twin Falls	LaJolla	New Orleans	Riverside	Blue Hill	Newport	State College	Put-in-Bay	East Wareham	Davis, Calif.	Fresno
1943	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
September 3	43	456	516	469	120	255	119	557	547	437	516	162	128	94	482	135	619	568
September 4	91	399	397	129	161	157	196	543	522	115	517	109	148	86	111	150	609	567
September 5	462	470	448	228	258	210	134	545	538	259	504	201	308	257	385	430	591	556
September 6	506	378	587	221	397	193	140	531	539	368	520	257	378	456	156	410	574	539
September 7	341	507	554	510	493	166	556	534	558	444	516	446	410	164	577	502	571	561
September 8	305	291	581	367	183	76	550	534	564	479	526	76	128	438	446	60	575	552
September 9	397	416	550	272	330	248	565	523	575	607	532	462	494	419	372	501	577	542
Mean	**306**	**417**	**519**	**314**	**263**	**186**	**323**	**538**	**549**	**387**	**519**	**245**	**285**	**273**	**363**	**314**	**588**	**555**
Departure	**−83**	**+43**	**+79**	.....	**−101**	**−26**	**−29**	**+30**	**+46**	**−37**	**+37**	**−126**	**−140**	**−121**	**−29**	**−54**	.....	**−6**
September 10	526	521	492	283	547	243	479	502	511	602	526	516	470	406	515	431	584	563
September 11	545	507	497	468	433	172	507	495	537	380	493	422	504	501	562	525	591	571
September 12	537	58	107	293	563	315	505	501	552	579	514	567	467	570	494	417	585	569
September 13	539	70	250	181	538	100	312	491	293	438	521	553	551	531	310	553	569	556
September 14	423	267	500	185	336	257	200	494	355	409	515	472	464	534	282	473	566	540
September 15	488	483	496	143	462	147	333	489	350	352	516	253	343	397	380	187	574	546
September 16	366	274	374	290	343	273	221	299	391	108	503	383	389	257	489	393	571	543
Mean	**489**	**312**	**388**	**264**	**460**	**215**	**365**	**467**	**427**	**438**	**512**	**452**	**455**	**456**	**433**	**426**	**577**	**555**
Departure	**+108**	**−33**	**−30**	.....	**+96**	**+9**	**+41**	**−8**	**−56**	**+78**	**+53**	**+74**	**+57**	**+47**	**+51**	**+86**	.....	**+26**
September 17	390	514	511	403	285	67	524	467	.....	48	487	207	147	322	279	168	564	501
September 18	556	478	473	496	563	160	424	457	333	95	466	522	494	532	519	494	567	524
September 19	461	343	268	504	452	115	49	493	464	.....	468	525	534	484	506	507	553	506
September 20	108	514	507	223	218	114	58	477	306	254	428	416	394	366	172	409	537	514
September 21	76	370	442	375	211	192	356	472	246	229	462	345	370	315	341	363	519	483
September 22	382	488	231	354	136	228	388	469	517	501	480	87	118	365	428	108	517	502
September 23	411	454	404	250	436	190	298	467	403	338	449	393	438	326	358	359	456	467
Mean	**340**	**452**	**407**	**373**	**329**	**152**	**300**	**472**	**378**	**209**	**463**	**356**	**355**	**387**	**372**	**344**	**530**	**500**
Departure	**−33**	**+100**	**−2**	.....	**−10**	**−15**	**−26**	**+35**	**−41**	**−131**	**−7**	**−9**	**−19**	**−19**	**+6**	**+11**	.....	**+12**
September 24	432	110	472	251	345	102	501	395	200	522	422	327	261	236	476	276	463	463
September 25	353	377	491	242	327	81	477	312	130	433	333	359	312	356	183	317	483	315
September 26	514	452	417	395	512	102	485	293	467	339	314	484	441	475	399	435	483	486
September 27	466	284	449	390	398	122	414	442	296	220	443	462	464	399	448	383	491	494
September 28	454	189	392	294	332	192	375	387	354	119	416	414	404	397	362	336	465	487
September 29	377	405	57	317	373	73	441	427	390	154	446	406	371	369	380	269	492	486
September 30	98	235	208	302	73	129	404	437	268	162	441	74	113	365	236	91	500	465
Mean	**385**	**293**	**355**	**314**	**337**	**114**	**442**	**385**	**301**	**278**	**402**	**361**	**338**	**371**	**355**	**301**	**482**	**457**
Departure	**+33**	**−5**	**−7**	.....	**+23**	**−22**	**+114**	**−53**	**−78**	**−98**	**−45**	**+15**	**−13**	**+30**	**+15**	**−39**	.....	**+8**

ACCUMULATED DEPARTURES ON SEPTEMBER 30, 1943

	+3752	+2849	+4837	.....	−3542	+1344	+4354	+2254	−4060	.....	+1169	−4004	−1050	−4109	−147	+805	.....	

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR SEPTEMBER 1943

[Communicated by Capt. J. F. Hellweg, U. S. N. (Ret.), Superintendent, U. S. Naval Observatory.] All measurements and spot counts were made at the Naval Observatory from plates taken at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day, under longitude, latitude, area of spot or group, and spot count are included assumed longitude of center of the disk, assumed latitude of center of the disk, total area of spots and groups and total spot count.

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1943	*h m*		°	°	°	°				
Sept. 1	9 19				No spots				G	Mt. Wilson.
2	9 13				No spots				G	Do.
3	9 7	(*)	+74	185	+5	74	12	2	VG	Do.
				(111)	(+7)		12	2		
4	9 6				No spots				G	Do.
5	10 35				No spots				F	U. S. Naval.
6	9 5	(*)	−27	44	+7	27	12	2	VG	Mt. Wilson.
		7611	+5	76	+14	9	16	2		
				(71)	(+7)		28	4		
7	10 59	7611	+20	77	+12	21	206	25	VG	U. S. Naval.
				(57)	(+7)		206	25		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR SEPTEMBER 1943—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1943	*h m*		°	°	°	°				
Sept. 8	13 48	7611	+34	76	+13	35	436	44	VG	Do.
				(42)	(+7)		436	44		
9	10 40	7611	+43	74	+13	43	388	7	VG	Do.
		7611	+47	78	+13	47	218	35		
		7611	+51	82	+14	51	145	2		
				(31)	(+7)		751	44		
10	11 38	7612	+21	38	−4	24	6	1	F	U. S. Naval.
		7611	+58	75	+13	58	436	6		
		7611	+60	77	+13	60	73	1		
		7611	+66	83	+14	66	461	4		
				(17)	(+7)		976	12		
11	10 43	7613	−11	357	+14	13	24	4	F	Do.
		7611	+69	73	+13	69	436	2		
		7611	+72	76	+14	73	145	1		
		7611	+81	85	+15	81	461	4		
				(4)	(+7)		1066	11		
12	10 35	7613	+2	353	+14	8	12	2	VG	Do.
		7611	+83	74	+13	83	436	1		
		7611	+86	77	+14	86	145	1		
				(351)	(+7)		593	4		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR SEPTEMBER 1943—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1943 Sept. 13	h m 9 10		°	° No spots	°	°			VG	Mt. Wilson.
14	9 7			No spots					G	Do.
15	9 10			No spots					G	Do.
16	14 53	7615	−18	278	−34	45	24	7	G	Do.
		(*)	+3	299	−19	27	12	2		
		7614	+28	324	−10	33	36	3		
				(296)	(+7)		72	12		
17	9 15	7616	−9	277	−8	18	12	1	VG	Do.
		7615	−3	283	−34	42	12	2		
		(*)	−3	283	−6	14	12	3		
		7614	+42	328	−9	45	12	1		
				(286)	(+7)		48	7		
18	10 50	7616	+4	276	−8	16	145	19	G	U. S. Naval.
				(272)	(+7)		145	19		
19	11 17	7616	+15	273	−9	22	73	1	G	Do.
		7616	+20	278	−8	25	97	13		
				(258)	(+7)		170	14		
20	9 18	7616	+28	274	−9	33	73	15	VG	Mt. Wilson.
		7616	+34	280	−7	38	61	7		
				(246)	(+7)		134	22		
21	9 27	7616	+42	275	−9	46	48	10	VG	Do.
		7616	+47	280	−7	50	48	17		
				(233)	(+7)		96	27		
22	10 34	7616	+56	275	−8	58	24	8	G	U. S. Naval.
		7616	+61	280	−8	63	36	11		
				(219)	(+7)		60	19		
23	10 37	7616	+71	277	−8	72	24	6	G	Do.
				(206)	(+7)		24	6		
24	9 0			No spots					G	Mt. Wilson.
25	12 42			No spots					G	U. S. Naval.
26	11 15	7617	−87	79	+15	87	290	1	F	Do.
				(166)	(+7)		290	1		
27	10 59	7617	−87	66	+14	87	97	2	G	Do.
		7617	−78	75	+13	78	48	1		
		7617	−73	80	+15	73	485	1		
				(153)	(+7)		630	4		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR SEPTEMBER 1943—Continued

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1943 Sept. 28	h m 10 52	7617	° −71	° 69	° +14	° 71	109	3	G	Do.
		7617	−59	81	+16	59	533	1		
				(140)	(+7)		642	4		
29	11 8	7617	−57	69	+14	57	73	2	G	Do.
		7617	−44	82	+16	45	558	1		
				(126)	(+7)		631	3		
30	11 0	7617	−43	70	+13	43	61	2	G	Mt. Wilson.
		7617	−31	82	+16	33	558	1		
				(113)	(+7)		619	3		

Mean daily area for 30 days = 254

(*)Not numbered.
VG = very good; G = good; F = fair; P = poor.

PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR AUGUST 1943

[Based on observations at Zurich. Data furnished through the courtesy of Prof. W. Brunner, Swiss Federal Observatory, Zurich, Switzerland]

August 1943	Relative numbers	August 1943	Relative numbers	August 1943	Relative numbers
1	10	11	19	21	36
2	17	12	19	22	22
3	*d* 8	13	19	23	20
4	8	14	*ad* 26	24	9
5	18	15	25	25	0
6	18	16	25	26	0
7	17	17	32	27	*Mc* 11
8	*d* 27	18	41	28	12
9	*a* 25	19	*a* 53	29	10
10	18	20	49	30	7
				31	0

Mean, 31 days = 19.4

a = Passage of an average-size group through the central meridian.
b = Passage of a large group through the central meridian.
c = New formation of a group developing into a middle or large center of activity; E, on the eastern part of the sun's disk; W, on the western part; M, in the central-circle zone.
d = Entrance of a large or average-sized center of activity on the east limb.

U. S. GOVERNMENT PRINTING OFFICE: 1943

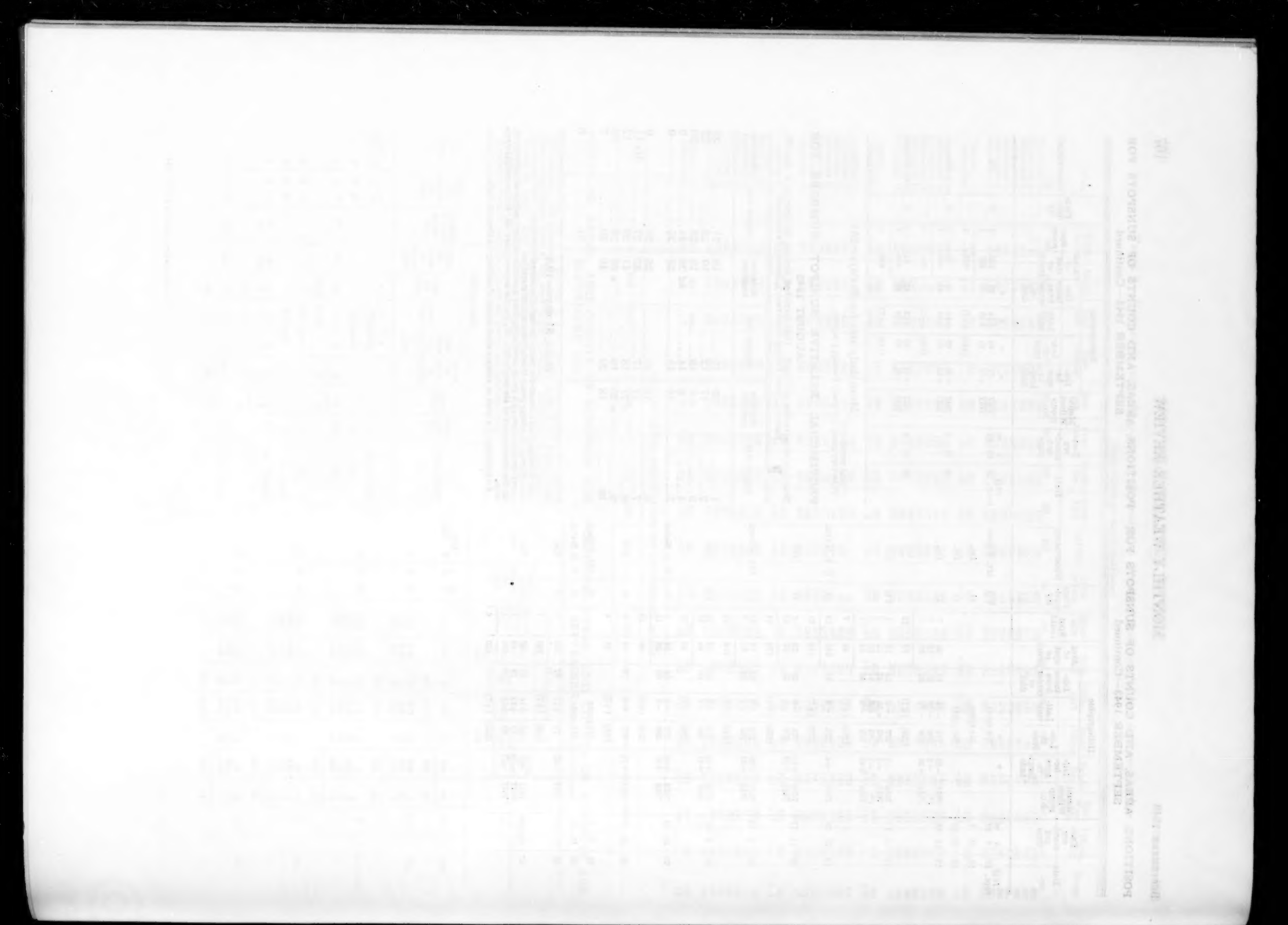
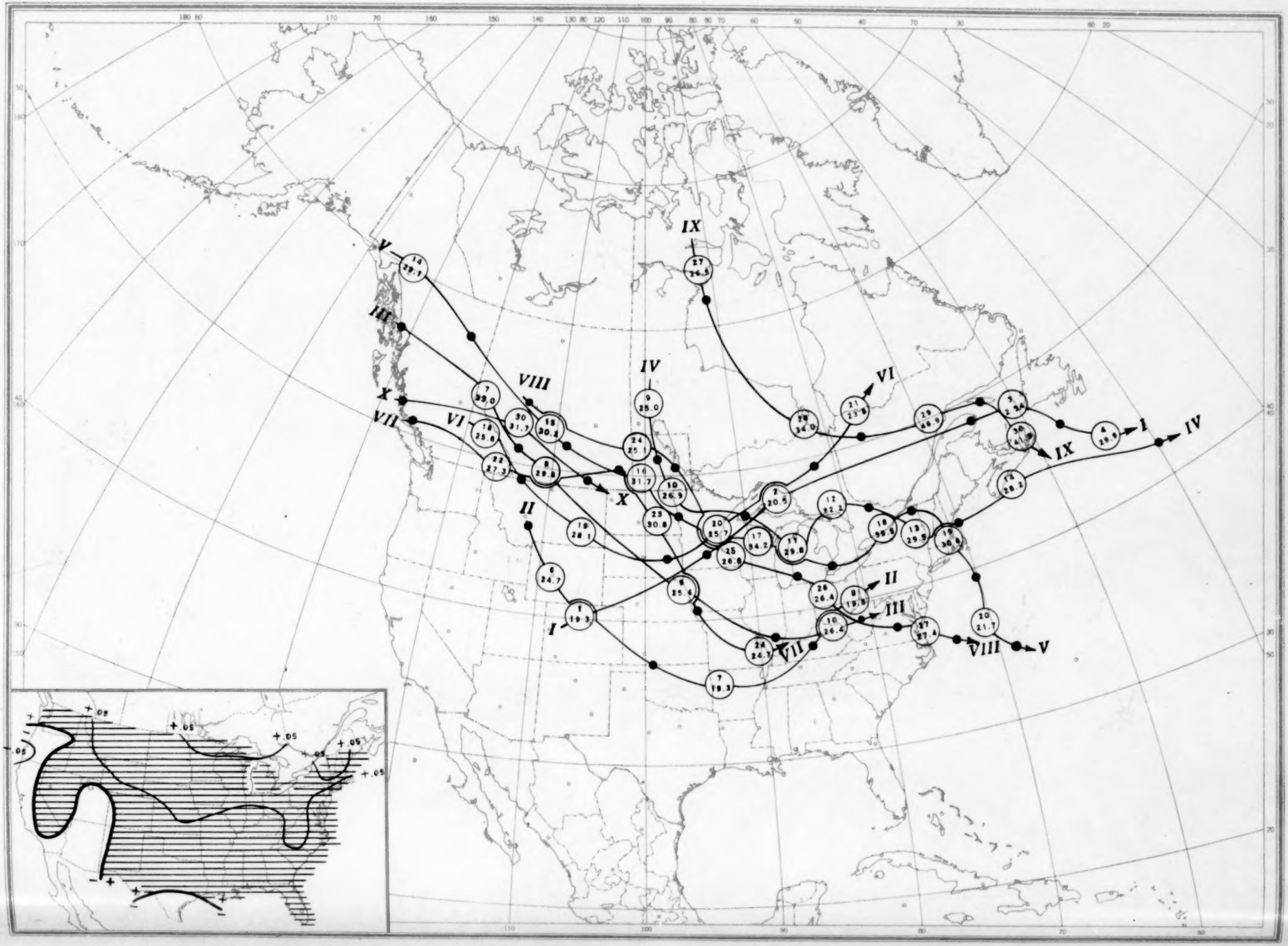


Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, September 1943

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, September 1943

HOURLY PERCENTAGES
Shaded portions show excess (+)
Unshaded portions show deficiency (−)
Lines show amount of excess or deficiency

Chart II. Tracks of Centers of Anticyclones, September 1943. (Inset) Departure of Monthly Mean Pressure from Normal

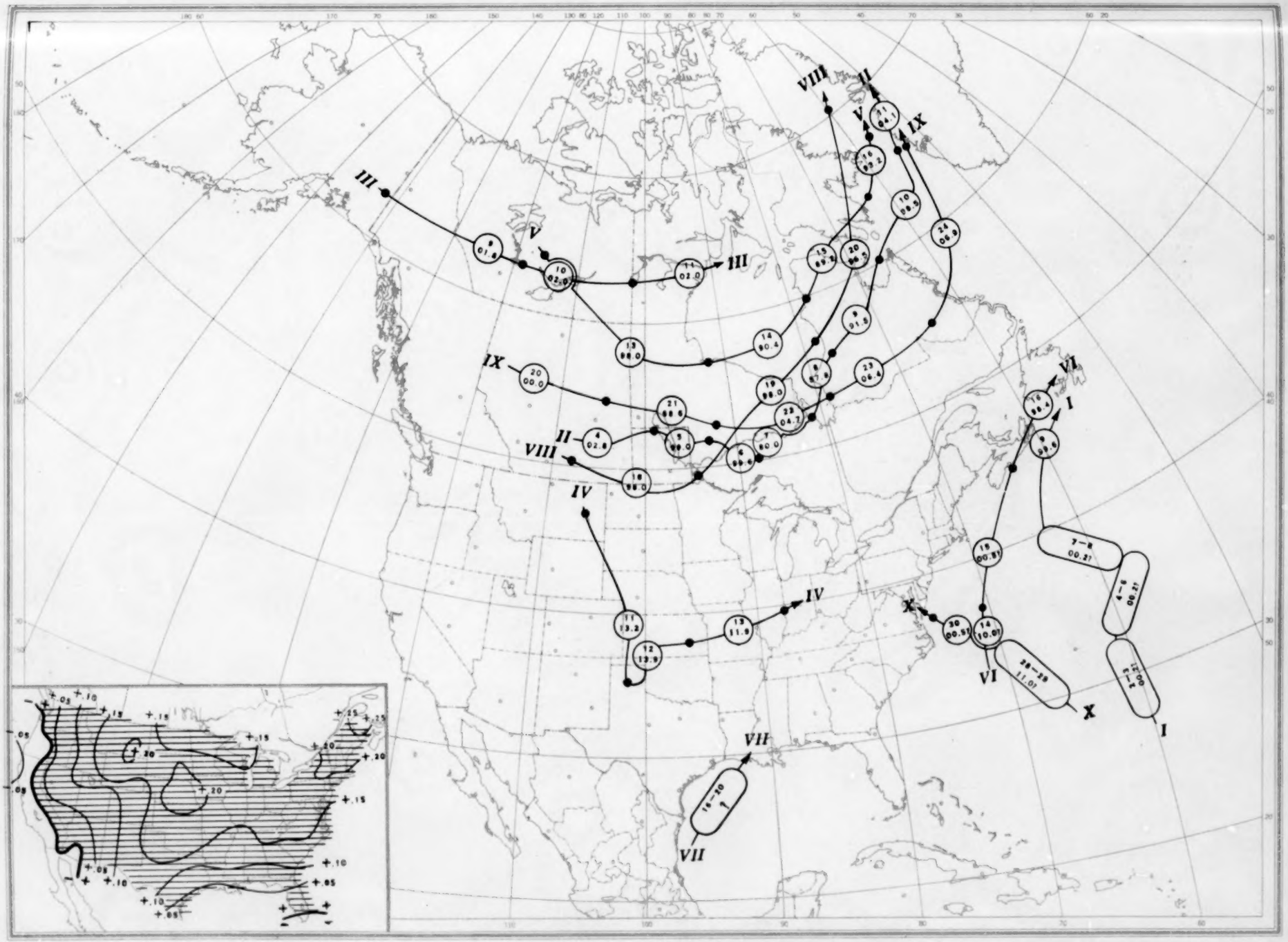


Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time)

Chart III. Tracks of Centers of Cyclones, September 1943. (Inset) Change in Mean Pressure from Preceding Month

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time)

Chart III. Tracks of Centers of Cyclones, September 1943. (Inset) Change in Mean Pressure from Preceding Month



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, September 1943

Chart V. Total Precipitation, Inches, September 1943. (Inset) Departure of Precipitation from Normal

Chart V. Total Precipitation, Inches, September 1943. (Inset) Departure of Precipitation from Normal

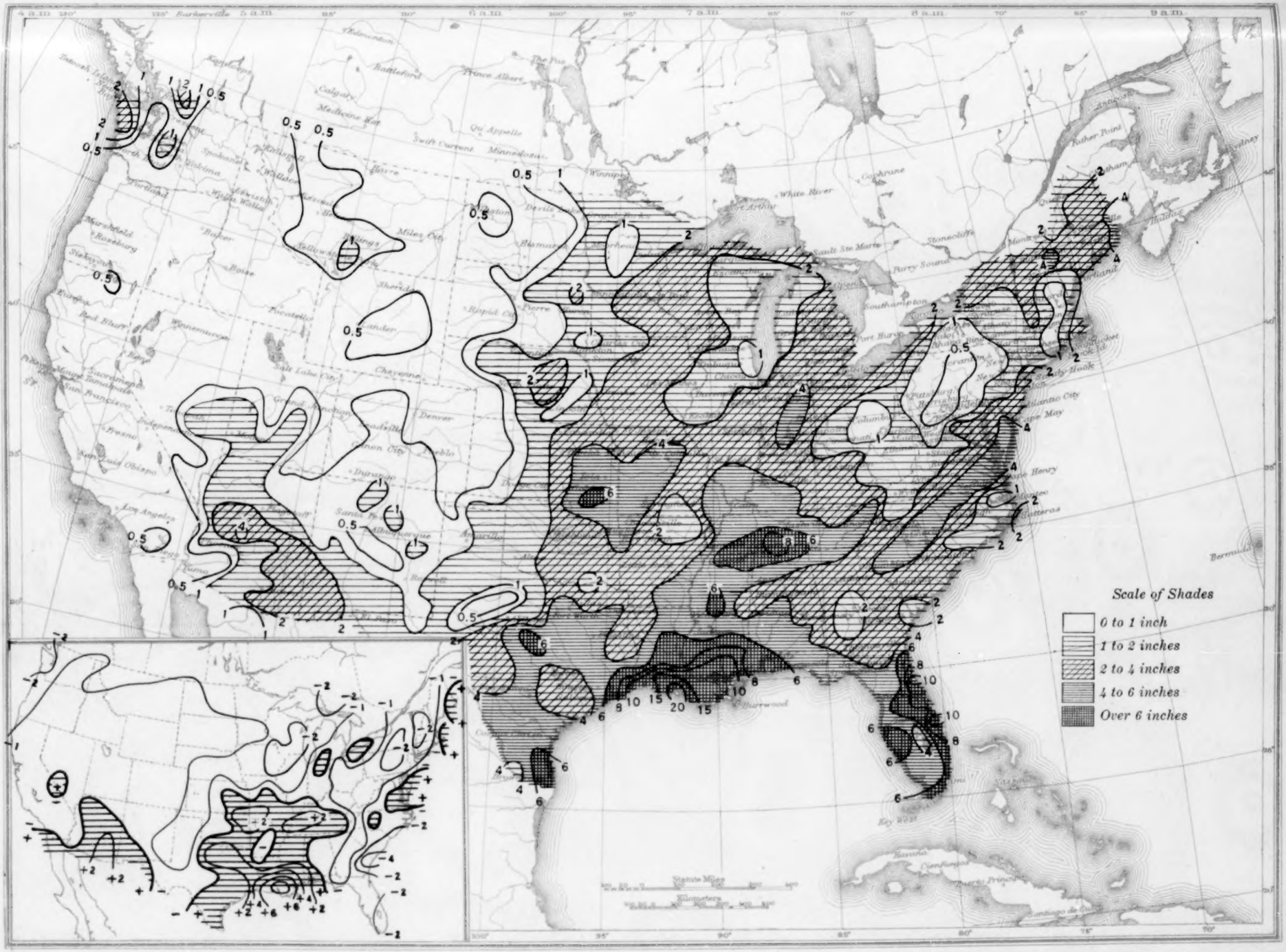
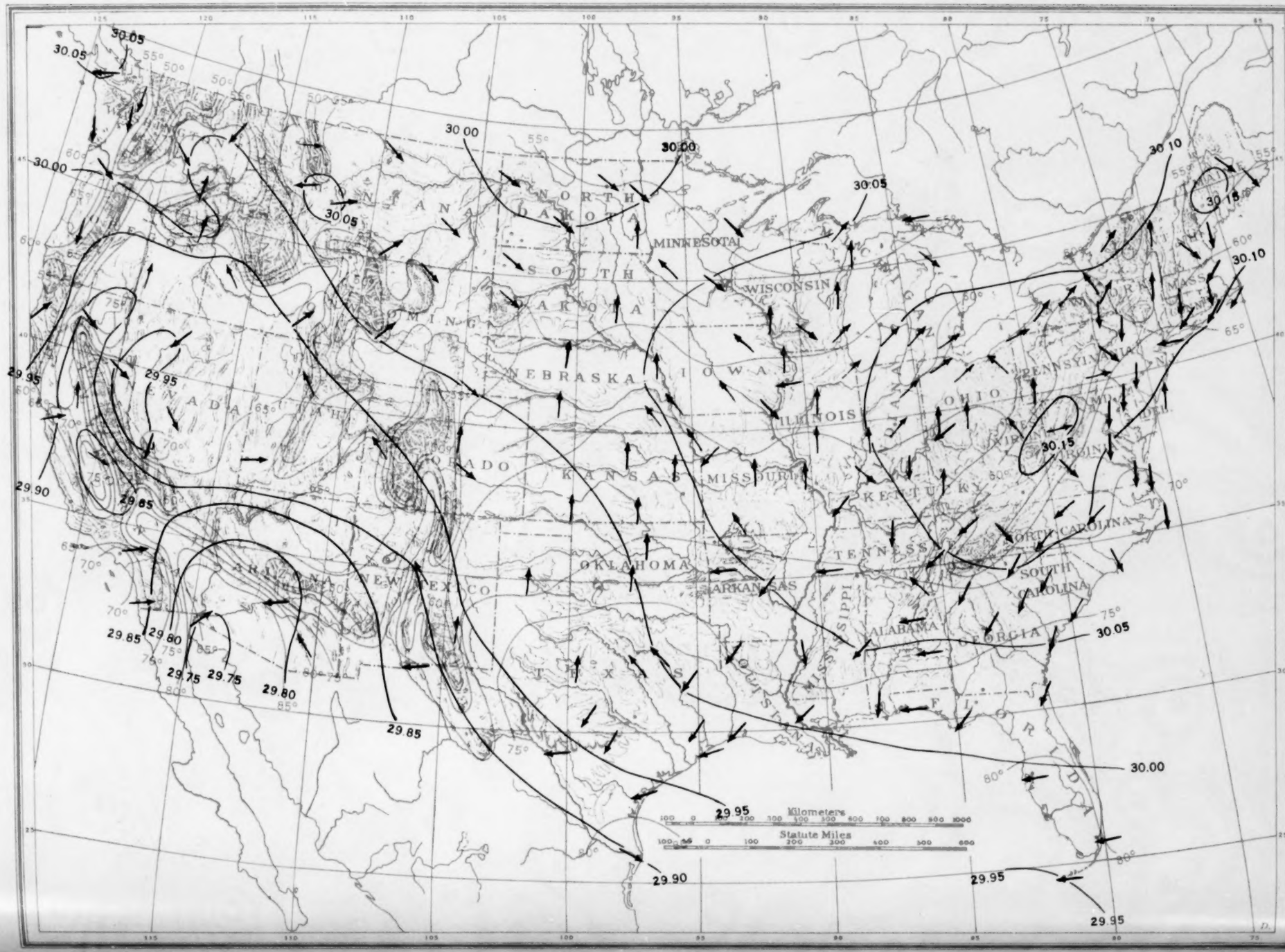



Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, September 1943